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Aslib Proceedings

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incorporating Aslib Information

The SCAN system:
a real-time financial information service
JOHN C.C.DICKS

Access to primary materials in the social sciences
JOHN E.PEMBERTON

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Aslib Proc. vol.22 no.1 pp.1-36 London, January 1970

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TUE.17.	Aslib Midlands Branch Meeting. Future Roles of Aslib and the L.A. Speaker: D. T. Richnell. Loughborough Library School. 6.15 p.m.
WED.25.	Evening Meeting at Aslib. Facsimile Transmission. Speaker: J. J. Hall (Bristol Building and Design Centre). 5 for 5.30 p.m.
THU.26.	Aslib Co-ordinate Indexing Group Meeting and Lecture. The relation of a thesaurus to indexing terms. Aslib. 3.30 p.m.
FRI.27–SUN.1.	Aslib Transport Group. Week-end Conference. Sunningdale Park College, Ascot.
March	
WED.4.	One-Day Conference on In-Training of Library and Information Staff. Imperial College, London.
FRI.20.	Scottish Branch Annual General Meeting and Conference. Stirling.
TUE.24.	Aslib Midlands Branch Annual General Meeting. Arden Hotel, Birmingham. 6.15 p.m.
WED.25.	Evening Meeting at Aslib. Plans for a new system of business statistics. Speaker: M. C. Fessey (Business Statistics Office). 5 for 5.30 p.m.
April	
FRI.10–SUN.12.	Aslib Aeronautical Group Conference. Cranfield.
WED.22.	Aslib Annual Lecture. The light of knowledge: new lamps for old, by Professor J. M. Ziman, FRS.
THU.23–SAT.25.	Aslib Joint Northern Midland Branch Conference. Derwentwater Hotel, Portinscale, Keswick.

New members

CORPORATE

(*specialized Group interests are given after names, where relevant*)

Name	*Locality*	*Representative*
Brocades/Great Britain	Byfleet	—
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Hawker Siddeley Aviation Ltd	Hatfield	—
Kier Ltd (*Eng*)	Sandy, Beds.	O. Wewer Fice
Nitrigin Eireann Teoranta (*Chem, Eng*)	Co. Wicklow, Eire	Miss S. Nevin
Scientific Control Systems Ltd (*Aero, Chem, Econ, Eltron, Eng, Trans*)	London	T. Chevenix-Trench
Tracked Hovercraft Ltd (*Eng, Trans*)	Cambridge	A. Buckton
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Gothenburg School of Economics	Sweden	T. Vallin
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Lindsey and Holland County Library	Lincoln	E. H. Roberts
National Council for Educational Technology (*Eltron, Audio-Vis*)	London	L. A Gilbert
North Birmingham Technical College (*Bio, Chem, Eltron, Eng*)	Birmingham	M. A. Pearman
Poultry Research Centre (*Bio, Chem, Eltron, Eng*)	Edinburgh	J. B. Coltherd

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G. L. Cairns	London	Miss H. M. Townley	London
Miss P. J. Compton	Northern Ireland	A. L. Webb	Kings Langley
J. O'Connor	Penna, USA	Miss E Werngren	Stockholm

In-service training of library and information staff

In order to offer some guidance on the problem of providing adequate training to newly appointed library and information staff and others, Aslib is organizing a one-day conference to be held on 4th March 1970 at the Imperial College of Science and Technology, London SW7. Entitled 'In-service training of library and information staff', the conference will provide an opportunity for practical discussion of training problems, particularly in small and medium-sized units.

The opening lecture will be given by Dr Alec Martin, Head of Industrial Training Research and Information Group at the Department of Employment and Productivity, who will talk on the practical problems of in-service training in a small information service. This will be followed by a talk by Mrs Elizabeth Mack, Head of Aslib's Library and Information Services, on methods and techniques of in-service training as exemplified by practices developed in the Aslib Library and Information Departments.

Mr Kenneth Boodson, Librarian of the Imperial Metal Industries (Kynoch) Ltd, will give the third lecture on the significance of staff structure and promotion policy, and will cover the problems of job description, the designation of grades, staff incentive schemes, etc. The final talk will be on co-operative schemes for in-service training by Mr D. I. Colley, City Librarian of the Manchester Public Libraries.

The chairman will be Mr L. J. Anthony, Assistant Director (Services) of Aslib. A discussion session will follow each lecture. Further details can be obtained from the Meetings Organizer at Aslib.

FIND (Facsimile Information Network Development)

At an evening meeting at Aslib on Wednesday 25th February Mr John J. Hall, Director of the Bristol Building and Design Centre, will speak on the FIND service.

Between 1966 and 1967 the day-to-day information needs of members of the professions and trades within the Construction Industry were researched and evaluated so as to establish basic user requirements. From 1967 to the present day a practical experiment aimed at fulfilling these requirements has been developed and operated by the Bristol Building and Design Centre with the support of the Association of Building Centres and the Construction Industry Research and Information Association. This experiment shows very promising results and is being further developed and enlarged.

Facsimile machines are an integral part of this development and the Director of the FIND service will talk about this work and its progress over the past four years. Facsimile machines will be available for demonstration purposes and use by guests attending.

The meeting will be chaired by Mr C. E. Rogers, Deputy Librarian, Ministry of Public Building and Works, and will begin at 5.30 p.m. (tea 5 p.m.).

Plans for a new system of business statistics

Mr M. C. Fessey, Director of the Business Statistics Office, will speak on the Government's plans for a new system of business statistics at an evening meeting at Aslib on Wednesday 25th March 1970.

These plans were first described in articles in the Central Statistical Office publication, *Statistical News,* in May 1968, and the Business Statistics Office was set up at the beginning of 1969 to bring the new scheme into operation. An essential element of the new scheme is the Central Register of Businesses. This will replace the registers maintained in the various government departments on which the different statistical enquiries are at present based and hence should lead to greater integration between different statistical enquiries. The basis of the statistics too will change: the censuses of production which have been conducted at intervals of roughly five years since the beginning of the century will be replaced by an integrated system of quarterly and annual enquiries, supplemented by some monthly figures and by special enquiries at intervals of perhaps three years. Statistics of distribution too are coming under review.

Mr Fessey will describe how these plans are developing and will say something, too, about the problems of developing a programme for publishing the statistics coming out of the new system.

The Chairman will be Mr Frank Cochrane, Librarian of the Board of Trade Statistics and Market Intelligence Library, and the meeting will begin at 5.30 p.m. (tea 5 p.m.).

Transport Group

The above lecture by Mr Fessey on the Government's new system of business statistics, to be given at the Aslib evening meeting, will also be given at a meeting of the Transport Group on Wednesday 4th February 1970. It is to be held in collaboration with the Motor Industries Information Group at the University of Aston in Birmingham, and will begin at 2.30 p.m.

Because of the venue and importance of the subject, members of Aslib (particularly those in the Midlands area) who are not members of the Transport Group, and who will be unable to be present at the evening meeting at Aslib, are very welcome to attend. Time will be allowed after the lecture for the audience to voice its opinions on the type and form of statistics it needs.

The chairman will be Mr K. A. Yoemans of the Department of Economic and Social Statistics. Non-members who wish to attend are asked to notify Mr E. W. Roberts, Marine Library, Board of Trade, Norman Shaw North Building, Victoria Embankment, London SW1.

The third conference of the group will take place at Sunningdale Park College, Berkshire, from Friday 27th February to Sunday 1st March 1970. The theme of the conference will be 'Tracking down transport information' and sessions will be devoted to the publishing scene, sources of official information, information schemes and management. The brochure, with reservation form, has been sent to members of the group. Non-members will be welcome and can obtain copies of the brochure from Mr E. W. Roberts at the address above.

Engineering Group

Members are asked to note that the address of the Secretary of the Aslib Engineering Group, Miss E. D. Norman, is now: Burmah Oil Trading Ltd, Burmah House, 57 Chiswell Street, London EC1. Tel: 01-628 7088, ext. 268.

Aeronautical Group

The next Aslib Aeronautical Group Annual Conference will be held at Cranfield from 10th to 12th April 1970. Among the events already arranged are talks by Mr J. F. Blagden of BIM on 'Management Information Services', Mrs W. I. Veasey of Blackwells on 'Bookseller-Librarian Relations' and an open forum by students of the College of Librarianship, Wales, on 'Special Librarianship—the student's view'. Further details may be obtained from Mr E. J. MacAdam, Deputy Librarian, The College of Aeronautics Library, Cranfield, Bedford.

Joint Northern/Midlands Branch Conference

This conference will be held from 4 p.m. on Thursday 23rd April to midday on Saturday 25th April 1970, at the Derwentwater Hotel, Portinscale, Keswick. The subjects to be covered by the eight speakers include: duties and responsibilities of the special librarian; staff management; metrication and the special library; standards and specifications; current information as applied to a newspaper library, and a review of the first six months' work of the Aslib Midlands Regional Liaison Officer. For further information apply to Mr T. A. Silverwood, Information Officer, Ferodo Ltd, Chapel-en-le-Frith, Stockport, Cheshire. The closing date for applications is 1st March 1970.

Data processing and the national library system

The Department of Education and Science has announced that a project team has been established to study the feasibility of applying automatic data processing to the operations and services of the main national libraries and other organizations providing central services for the country's library system.

The team will be under the direction of Mr Maurice B. Line, Librarian of Bath University of Technology, who took up this work at the beginning of January. The team is based at Bath University and it is expected that the study will take one and a half to two years to complete.

This study was recommended by the National Libraries Committee, the basic requirement being outlined in Chapter 13 of the report of that body (Cmnd. 4028) published in June 1969.

Institute of Information Scientists

The Fourth Conference of the Institute will be held at Wessex Hall, University of Reading, from Friday 10th to Sunday 12th April 1970. Speakers at the conference will include Dr W. E. Batten (UKCIS) and Rowena Swanson (Air Force Office of Scientific Research) on current thinking and developments in information; J. N. Wolfe (University of Edinburgh), A. G. Cheney (Culham) and John Martyn (Aslib) on the effectiveness of information dissemination; Helen Townley (Leasco), V. Hardman (ICL) and Dr D. G. Rowlands (Unilever) on the subject of mechanization in information work; J. E. L. Farradane speaking on the Institute—past, present and future, and finally, Dr Hazel Mews (Reading University), M. B. Line (Bath University) and Dr P. Leggate (University of Oxford) on information work and literature promotion in universities.

Displays and demonstrations of information systems have been arranged. The conference secretary is Mr Lindsay Corbett at AWRE, Aldermaston, Reading, from whom further details may be obtained.

London Chamber of Commerce Forum

Information storage and retrieval will be the subject of the London Chamber of Commerce Forum to be held on Thursday 29th January. Guest of honour at the luncheon will be Dr Ernest Davies, MP, Joint Parliamentary Secretary, Ministry of Technology.

Mr Brian Vickery, Assistant Director (Research) at Aslib, will give the opening address on the needs and problems of information storage and retrieval. Other speakers will include Mr Adrian Perodeau, Manager of the Jonker Information Retrieval Division at George Anson & Co. Ltd, who will speak on the mechanization of information procedures; Mr Derek Barlow, of Leasco Systems & Research Ltd, on computerized systems of storage and retrieval, and Mr Gordon Booth, Director of the Export Services Branch at the Board of Trade, who will be describing for the first time the Board of Trade's new computerized export intelligence service.

Mr Leslie Wilson, Director of Aslib, will join the speakers in the final session to discuss points raised by the delegates. The meeting will be chaired by Mr Cyril Monk, Chairman and Managing Director of Learning Systems Ltd. Further information can be obtained from the LCC Forum, London Chamber of Commerce, 69 Cannon Street, EC4. Tel: 01-248 4444, ext. 302.

NLL supplementary publications scheme

In consultation with interested journal editors, the National Lending Library for Science and Technology is to make available detailed material which supplements articles published in the normal scientific journals. This scheme is the result of the growing volume of research activities, the increasing facilities for producing and analysing data mechanically and the rising costs of printing, all of which are making it very difficult to publish in the normal way details of the experimental data available.

Under this scheme the supplementary material sent with parent articles to journal editors would be sent to the NLL, where it would be stored on microfiche. The microfiche can then be obtained from the NLL quoting the supplementary publication number appearing in the parent article. A single microfiche will accommodate fifty-eight pages in microform, while additional pages are accommodated on 'trailer' fiches, holding seventy pages each.

A similar scheme (known as the National Auxiliary Publications Service) is being operated in the USA by the American Society for Information Science. Schemes may also be contemplated in other countries and the NLL will investigate the possibility of exchange of supplementary data between the national centres.

Further details, including copy specifications, can be obtained from the National Lending Library for Science and Technology, Walton, Boston Spa, Yorkshire.

National Central Library

NATIONAL CENTRAL LIBRARY. Fifty-third annual report of the Executive Committee for the year ending 31st March 1969.

The year was again marked by important developments which may have a considerable impact on the future of the NCL. The trustees were invited to submit evidence to the Dainton Committee on National Libraries on the organization and services of the NCL and this was submitted to the Committee in July. Dr Dainton and his colleagues also visited the Library in July, and in October representatives of the Board of Trustees and the Executive Committee (Sir Frank Francis, Dr B. S. Page, and the Librarian) gave oral evidence before the Committee. The Dainton Report had not been published by the end of the financial year but, needless to say, it was expected to be of major importance both to the future of NCL and to the future of library co-operation in this country.

The Report records a marked increase in the number of loan applications. This indicates a reversal of the trend reported in 1967–68 and can be explained partly by the growth of universities and the increasing number of loan applications from their libraries, and partly on the assumption that libraries borrowed books which under more favourable economic circumstances they might have bought. Despite this increase the success rate of requests satisfied, about 75 per cent, was about the same as for the previous year. It is interesting to note that the Report again records an increase in the number of applications returned to the applying library with queries. As also mentioned last year, this 'reflects the disappointing standard of bibliographical verification carried out in libraries'.

The Executive Committee expressed its appreciation to the Department of Education and Science for its increase in grant-in-aid made to the Library. The Library's bookfund benefited considerably from this and allowed the Library to expand its loan collection in areas where demand was greatest. Surveys had shown that recent American books were in considerable demand and priority was given therefore to the purchase of American books in the humanities and social sciences.

The Outlier libraries, which are mainly special libraries, continued to lend books through the NCL and there was an increase during the year in the number of applications satisfied by these libraries. There are now 394 outliers and the Report mentions that the Library would be glad to include in this list any library possessing specialized collections which they are prepared to lend through the NCL.

Institute for Scientific Information

Current Abstracts of Chemistry

In January 1970 the Institute for Scientific Information will begin publication of a new information service called *Current Abstracts of Chemistry.* This will provide weekly coverage of two hundred of the most important chemical journals in the world and selective coverage of a further 2,300 journals from related disciplines. These were selected on the basis of statistical studies which showed that 98 per cent of the significant papers on chemical subjects were contained in these publications. Papers will be reported within thirty to forty days after their primary publication and it is hoped to report about fifty thousand a year.

ISI's service *Index Chemicus,* which contains abstracts describing new chemical compounds and reactions, will be integrated into *Current Abstracts of Chemistry* in the form of a separate multiple-index. *Index Chemicus* will be published monthly and cumulated semi-annually and annually, and will contain author, journal, molecular-formula, and subject indexes.

Subscription rates for *Current Abstracts of Chemistry* are $1,100 a year for industrial and $750 for educational organizations. All subscriptions include a copy of the *Index Chemicus* section.

Index Chemicus Registry System

Designed for use with the *Index Chemicus* section of *Current Abstracts of Chemistry* is ISI's *Index Chemicus Registry System* (ICRS), a four-part information retrieval system for chemical compounds.

ICRS consists of two magnetic-tape files received monthly. One contains the bibliographic, use-profile, and analytical-instrumentation information published in the *Index Chemicus* section of *Current Abstracts of Chemistry*; the other contains the structural information and molecular formulae describing the compounds listed in the section encoded in the Wiswesser Line Notation (WLN). (This notation is also used in the ICI system for the computerized storage and retrieval of chemical formulae, known as CROSSBOW.) Subscribers also receive a bound print-out of the WLN file, and also the RADIICAL software package needed for searching the magnetic tape files, written in Assembly language for the IBM 360/30.

Further information about *Current Abstracts of Chemistry* and ICRS can be obtained from the Institute of Scientific Information, 132 High Street, Uxbridge, Middlesex.

University Librarian honoured by IATUL

Dr A J. Evans, BPharm, PhD, FLA, Librarian of Loughborough University of Technology, has accepted an invitation to become president of the International Association of Technological University Libraries. He has been treasurer of the Association since 1967.

In recent years Dr Evans has played an active part in the establishment of international library facilities as, for example, with the development of internationally agreed systems of classification, information retrieval and the mechanization of library procedures. He is also a principal in the joint research programme with Southampton University on the development and testing of automated library processes, sponsored by OSTI.

Dr Evans is the first British president of the Association, which was founded in 1955 and which now has ninety-eight member universities in thirty countries.

IATUL will be holding its fourth Triennial Conference at Loughborough University of Technology from 31st March to 3rd April 1970. The theme of the conference is 'Re-educating the library user: present and future needs in technological universities'. Further information about the conference can be obtained from Dr Evans at Loughborough.

New preservation and storage system

An ICI material—'Melinex' polyester film—that was used in the radiation monitoring devices worn by the Apollo 11 astronauts during their moon-walk, is now being used to protect a collection of fragments of ancient Hebrew documents at the Cambridge University Library.

The new system, adapted by library staff from a method developed in Holland, prevents damage to documents while they are being handled. It takes the form of a series of folders which are held within a loose-leaf binder to form a book. Documents can be inserted or withdrawn without difficulty, and because the system allows the documents to 'breathe' they are prevented from drying out and becoming embrittled.

'Melinex' is a durable, flexible material and of sufficiently high optical clarity to allow photography of documents through the film. Compared with glass it is lighter in weight, cheaper, and presents no storage or handling problems.

Symposium on Gas Chromatography

The 8th International Symposium on Gas Chromatography is to be held in Dublin from 28th September to 2nd October 1970. It is being organized by the Gas Chromatography Discussion Group of the Institute of Petroleum and will include an exhibition of chromatographs and associated equipment. Further details may be obtained from the Executive Secretary of the Organizing Committee, Institute of Petroleum, 61 New Cavendish Street, London W1M 8AR.

A Happy New Year to Aslib Members

On behalf of the council and the staff, the Director wishes all members of Aslib a very happy New Year.

BRIEF REVIEWS

AMERICAN LIBRARY ASSOCIATION. (Library Administration Division.) The procurement of library furnishings: specifications, bid documents and evaluation. Proceedings of the Library Equipment Institute conducted at New York, 7th–9th July 1966. Edited by Frazer G. Poole and Alphonse F. Trezza. Chicago, 1969. 150 p. $3.75.

This is the third Institute on Library Equipment. The specific areas considered cover preparing contracts and purchase orders, writing bid documents, problems in the preparation of specifications and testing, and value analysis of laboratory tests and reports. Examples of good and bad specifications are provided and particular problems involved in preparing and writing bid documents are considered. The appendix presents a typical bid document used in the purchasing of library furnishings. This includes the invitation to bid, instructions to bidders, general conditions of the contract and detailed specifications and schedules of equipment.

CURRENT EUROPEAN DIRECTORIES: annotated guide to international, national, city and specialized directories and similar reference works for all countries of Europe. Compiled and edited by G. P. Henderson. Beckenham (Kent), CBD Research, 1969. 222 p. £6. (SBN 900246 02 2.)

This publication is a guide to directories and to other sources of directory information either published in Europe or including Europe as part of a worldwide coverage.

Europe is taken to include all states in Western and Eastern Europe except Turkey. The directory is in three sections: section one is general directories covering all Europe, followed by national directories arranged under countries in broad subject groups such as general yearbooks, commercial directories, directories of research establishments, libraries and information centres, biographical works and regional directories; section two is an alphabetical list of specialized directories of industries, trades, professions and other activities and also includes references to all works appearing in section one; the third section is an analytical subject index, in English, French and German, of the directories in section two by activities and by countries, and includes general references to the various categories (e.g. libraries) represented by sub-headings in section one.

The list for each country in the first section of the directory is preceded by useful notes on any peculiarities in the alphabetization of reference books, on postcodes, on common abbreviations used in addresses and business names, and on alternative forms of cities in various languages.

The details given for each entry include the title and an English translation of the title where necessary, name and address of the publisher and their agents in other countries, date of first edition, frequency, and full details of the latest edition known or seen, advance information about new editions, and an analysis of the contents of the directory. This last section gives information such as the area covered by the directory, categories of organizations and persons, etc., listed, indexes, and languages of the text.

This publication is another valuable directory from CBD Research.

INDIA WHO'S WHO 1969: Leaders—listed professionwise. New Delhi, INFA Publications, 1969. 448 p. $12.

The entries in this publication are arranged alphabetically under the profession in which the biographee is engaged. There are nine broad headings, such as public affairs, humanities and science, and these are subdivided into 125 specific professions. The details given in an entry include date of birth, qualifications held, publications and address. Many entries, however, only give name and address.

There is a name index, and appendices include leading associations, institutions and universities, libraries and a list of recipients of national and other awards.

INSULATION HANDBOOK 1969–70. 6th ed. Revised and edited by A J. Allsworth. London, Lomax Erskine Publications, 1969. 304 p. 15*s*.

The new edition of this handbook has taken account of the impending changeover to the Système International (SI) of metric measurements by providing data on insulation materials in this new language of measurement. Specific quantities of materials such as densities, thermal conductivities and compressive strengths have been listed in SI terms. Sizes of materials, however, have been retained in imperial units except where companies are already producing materials in SI module sizes.

The main contents include tables giving the dimensions and insulation values of all important thermal, acoustic and vibration insulating materials on the market in the UK; fixing systems and adhesives; legal requirements pertaining to thermal and acoustic insulation; relevant associations and institutions, and an alphabetical list of about eight hundred insulation manufacturers and contractors.

The new features of this edition are tables of materials for cold storage insulation and protective materials for pipe insulation.

LIBRARY ASSOCIATION. (Reference, Special and Information section. North Midlands Group.) Library resources in the East Midlands. Edited by L. F. Craik. London, 1969. 63 p. 30*s*. (SBN 85365 111 6.)

This is an alphabetical listing of libraries in the East Midlands, with the exception of school, private and commercially run libraries. The format of each entry is identical to previous guides in the series and information was obtained mainly by questionnaire. There are geographic and subject indexes, and appendices give details of local allocations under the National Coverage and Provincial Fiction Reserve schemes.

NATIONAL SCIENCE LIBRARY. (Health Sciences Resource Centre.) Conference Proceedings in the Health Sciences held by the National Science Library. Ottawa, 1969. 288 p. $10.

The list contains details of published proceedings of conferences, congresses, symposia, workshops, panels, etc., in the health sciences. Also included are symposia which were not actually 'held' but only editorially organized. Excluded are transactions of regularly held academic and society meetings and staff conferences.

The main section is an alphabetical list of entries which are in the language of the published proceedings. There are five indexes: keywords; organizing and/or sponsoring bodies; place; date; editors. These are useful access points, particularly when only limited information on a meeting is known. Keywords of all the non-English conferences are entered twice in the Keyword Index: in the vernacular and in the English language. There is an appendix giving a full list of keywords and 'see also' references.

All proceedings listed are held by the National Science Library, Ottawa, Canada.

This is to be an annually published serial with individual volumes appearing in September. Every second volume will be a cumulation of all preceding issues.

PHARMACOLOGICAL RESEARCH COMMUNICATIONS. Vol. 1, no. 1. March 1969. New York and London, Academic Press, 1969. 84*s* per annum.

This journal is now the official publication of the Italian Pharmacological Society. It appears quarterly and supersedes the Society's former publication, *Archivio Italiano di Farmacologia*, founded in 1932.

Papers are accepted on basic and applied pharmacological research and studies may be on either humans or animals. The sole language used in the journal will be English, which is 'intended as a mark of respect for the recent important scientific contributions made by workers in English-speaking countries'.

The first issue contains twenty-two papers on a variety of pharmacological research topics. The annual subscription is 84*s* ($10 abroad), which should be sent to Academic Press Inc. (London) Ltd, Berkeley Square House, Berkeley Square, London W1X 6BA. North and South American subscribers should write to the Academic Press at 111 Fifth Avenue, New York, NY 10003.

THE SCAN SYSTEM: A REAL-TIME FINANCIAL INFORMATION SERVICE

JOHN C. C. DICKS
International Data Highways Ltd

Paper presented at an Aslib Evening Meeting, Wednesday 22nd October 1969

THE company which originated the SCAN system started up in 1965, becoming committed to this venture toward the end of 1965. Until then it had dealt in computer-based financial information services but did not operate on the kind of scale needed to launch a commercially viable computer system of this kind.

The first version of SCAN went out to customers on-line in the true commercial sense on 15th June 1966. As such it was the first commercial real-time system of its kind in the world. There were similar systems operating in an in-house environment in both British and United States airlines and in North American industry, but this was the first venture to be based on a large common data bank.

Since these beginnings the company has grown at a rapid pace, being taken over in June 1968, thus gaining access to capital of the order needed to go forward in this industry.

Looking back it seems clear that the key factor in being able to develop real-time computing systems to stand up to a rigorous time-critical daily schedule was the high degree of hardware reliability which had then become possible, probably for the first time. I am sure that sophisticated systems could have been developed earlier for this kind of application but such software would have been useless without the hardware 'down-time' experience being guaranteed favourable.

In the real-time context there is the logical problem of not being able to turn back the clock. If a data file in the regular kind of data processing installation gets behind, fairly straightforward routines are needed to clear the updating backlog. In real-time, however, the order of transactions is of critical importance and a data file with a piece of updating history unprocessed is doubtful both as to currency and integrity and virtually impossible to reconstitute accurately.

The original proprietors of the company therefore decided on equipment with proven operating experience and which was available off-the-shelf: decisions amply justified by events.

Computer configuration

The central processor used in the computer configuration is the Univac 418-II real-time machine. It has a cycle time of 2.7 and an add time of 4 microseconds. The configuration is equipped with two identical central processing units each of 64K store, the maximum CPU capacity possible.

The whole configuration is in fact fully duplexed (not just CPUs) and under current operational routines the real-time service can be switched to the second processor manually or automatically in a few seconds. Under other operating routines available, not presently used as traffic does not justify this, parts of the configuration can be linked to the main real-time system or not, according to the level of business.

The second principal component of the hardware environment is the Fastrand II mass storage drum subsystem on which the central data bank and private files are located. These drums are usable in units each of a capacity of 132 million six-bit characters arranged in 192 basic storage areas and accessed by 64 read-write heads. The present minimum real-time configuration uses two such drum units hitched together though these are considered as one unit.

The drum unit has an average access time of 92 milliseconds—that is just under a tenth of a second—the drum itself rotating at 880 r.p.m. A small area of drum can lie under a fixed read-write head and information in this area can be accessed at a reliable speed of 35 milliseconds. One drum unit from each pair has this extra optional facility.

The configuration has taken delivery of two further smaller but faster drum units with an 8.5 millisecond average access time to which can be transferred lists and look-up tables presently residing in direct-access store.

The next hardware component for the real-time system is a standard magnetic tape cluster used to keep an audit of file-amending transactions passing through the real-time system. This file is called upon if through critical hardware or software failure we need to reconstruct the drum libraries by simulating exactly the real-time transactions merely by reprocessing them in the correct order—but speeded up rather like a silent film—using as the start point a drum situation of assured integrity.

The configuration is also equipped with a multiplexor subsystem (large anonymous cabinets) whose function it is to receive and sort, and sort and transmit characters from or to the remote users' communications lines. There is also equipment to convert power supplies to US standards and a pair of printers and card processors.

The machinery is used in 'batch' as well as real-time combinations, though the main justifications for the way it is is the real-time work.

Services produced on the hardware employed

SCAN services are arranged in three groups: SCAN 1, 2 and 3. Service 4 is being developed but will not go out to subscribers until mid-1970, and other applications are in proposal form.

SCAN 1 is the original service with which the company went on-line in mid-1966. To be frank it has run to seed somewhat and will probably be radically redeveloped during late 1970. At present, however, it is a straightforward specialized demand processing facility suite performing standard data retrieval and computation of values of, in computer terms at least, a limited degree of difficulty.

The kinds of programs operable by remote users are simple retrieval and computation of trends, variability of such data items as balance-sheet values, the searching of industry group records for securities conforming with variable input parameters by a profile matching technique, the calculation of redemption yields (rates of return on fixed-income securities) and, commercially most important, a portfolio valuation system.

This program, operable like all those mentioned so far in real-time by the user from this remote keyboard unit, provides for the valuation at the last official closing price of lists of shares which financial institutions manage for clients.

The program is entered for each security, the line of valuation computed and arrayed across the page, and an analysis prepared for output finally. This kind of transaction constitutes the major part of SCAN 1 traffic and perhaps illustrates the impact such a system can have when used merely to provide for present needs in a better way. Up to this point most valuations were prepared clerically, as many still are, with all the painful consequences implied.

First versions of SCAN 2, the company's second major service, went out on-line nearly two years ago. This aimed at providing a total solution to the portfolio valuation problem, combining the benefits of real-time computer-monitored clerical operations and the variety and sophistication that large computer systems can be made to provide—albeit with development costs sometimes being measured in lives rather than money.

Essentially SCAN 2 is divided into the real-time data capture (a more recent buzzword) and nightly batch processing cycles.

The real-time portion provides for the acceptance into the user's private library of details of the portfolios in his care. He builds on-line his own private library containing, for example, in the case of a portfolio, the number of shares held, the book cost of the holding and information to specify the content and appearance of the valuation to be produced when that falls due, either cyclically or in response to a special request. The subscriber can also build mini data banks on-line containing information about stocks his portfolios have but for which we do not hold details on the central data bank—either because they are private companies for which no public information is available or because they are too obscure to make the task of keeping central records up to date economically justifiable.

There are other elements within private libraries which I will talk about later. For the present these examples should provide some idea of the kind of SCAN 2 real-time traffic going through the system.

The batch runs have a housekeeping section where data captured during the day is processed, the large drum library structures being reorganized as necessary. Many of the transactions are fully effected during the real-time period and only a note that they had occurred is produced during the housekeeping. Other daytime amendments merely give rise to a notification to process an amendment that night.

The reasons for, as it were, taking two bites at the cherry are not primarily technical since, with the experience we have gained in massive data manipulation handling, most of the transactions are possible in real-time. The historic reason is that it was thought that subscribers might want to be able to change their mind about amendments so we could keep a note of their transactions and provide them on demand with the end result of all the changes.

A further reason is that to accomplish thoroughly such amendments would lead to a higher usage of configuration time during the daytime. The total amount of work done during the real-time period is constrained by the speed of the Fastrand drums, so there is thus a limit to the amount of activity that a transaction should engender. While civilized people are asleep the pressure is off this bottleneck and the real-time transactions can be economically accomplished. Some balance between timing of activity had to be struck for this reason.

Next, certain tasks such as complicated sorts take on an unrealistically high degree of difficulty when placed in the real-time environment, where core area is limited and amendments could be flowing in which might vitiate processing already performed.

The centrepiece of the SCAN 2 system is the production of the valuation, the treatment, content, order and even graphic appearance of which is specified by the remote user for each portfolio separately. Although technically not novel the process is perhaps interesting for its sheer scale. The program which produces these valuations is thought to be the largest free-standing program element prepared in low-level language in the UK occupying some 60K words of core, that is about 120,000 bytes.

SCAN 3 services provide custom-designed statistical lists covering the Government Securities market, the gilt-edged markets, and essentially provides for the calculation of complex yields which I referred to earlier. These yields represent the return an investment of £100 would bring allowing not only for the usual half-yearly interest payments but also for the capital gain, or loss, you get when the borrower redeems the security. It is an equation with the unknown on both sides and thus appropriately solved by machine.

The basis for these calculations are data-captured in real-time, processed in batch to produce magnetic tape for photocomposition, and then printed by an associate company.

The data bank

The preparation that I did for this part of the talk soon structured itself into a list of 'mistakes we have made by which, hopefully, others might learn'. I think this was inevitable since, although information science is old enough now to sport a technical rather than theoretical literature at the time this venture was started, experience of flexible, fast response, random access and, above all, massive data structuring for real-time applications was zero. Thus the standard kind of mistake of transferring experience in one application to that in another without rationale was often made. Thus we now have a series of data structures which make up the SCAN data base rather than one coherent structure.

This set of circumstances is excusable in that developments were subject to severe commercial pressure and the balance between means and ends was tipped towards getting the job out. The data bank, that is the common portion, is now in the process of being rationalized. The elements which make up the data base are broadly divisible into primary and secondary. The secondary portion is derived from basic data at present by means of batch housekeeping runs. These data will be dispensed with as we have developed structures which enable group retrieval. A further section is of a common type but quite distinct in function and structure, the information relating not to the progress of financial institutions but being tables of reference requiring updating such as currency rates of exchange.

A fourth group of data structures are particular to individual subscribers to the service. These are the lists of shareholdings I referred to earlier and the associated information specifying the ways in which they should be processed. Also included here are the lists and control data regulating the SCAN 3 programs.

To give some idea of the kind of data held, a company record, having from one to, say, thirty stock records, might contain:

an index value for each security enabling indices to be derived for groups other than just for securities which are components of established indices;

the amount issued and rights of each stock and the changes in these values;

the security's names and the amount in issue;

a six-year analysis of both balance sheet and profit and loss accounts;

a record of dividend and earnings performance.

The secondary data comprise a daily diary of events which have affected the file—new stocks coming in, old ones dying off, dates of interest to certain sections of the financial community—a warning that a 'call' or bill for some new security falls due in three days, for example. Also included is a bank of industrial records used in the profile matching facility which we can now reduce our reliance on.

The lessons learned in the design of data structures led to rather better designs for the private library structures. The elements may not be of significance outside the application but include portfolio subrecords, private library subrecords, footnote message areas, news journal areas, secondary records arranged by stock rather than by portfolio, and associated indices. Of more general interest is that the structures demonstrate the importance of some principles which I will touch on in a moment. For example:

the record can be shunted about the configuration without touching the inside of it. That is, the external interface is kept as fine as possible and the structure regulated internally;

the record can be variably structured to accommodate widely disparate types of user, flexible conventions being available to enable the internal structure to be worked out dynamically. Importantly, the flexibility has been achieved with reasonable economy of space. These records of permanent, valuable and privileged data now total about 100 million characters so that physical space is beginning to become a significant cost constraint;

considerable structural redundancy is incorporated, usually by keeping more than one count of the same value. This enables us to have foreknowledge of critical structural anomaly and to pick up the pieces if things go wrong.

This conveniently brings me to the last part of my formal remarks, an attempt to articulate some rules of data structure and program design which may be of value to those embarking on commitments in the data-bank business. I say articulate because the problem here is essentially one of language. There is unfortunately, in all senses except the grammatical, no real jargon that conveys quickly the essence of what is meant. So many of the words are inoffensive ones borrowed from other disciplines.

Briefly any design problem can be reduced to following a method or formula which guarantees you the solution if kept to. I do not want to labour this since the specifics are of more interest. First must come the definition and description of the problem in ways useful for its solution; second, the recognition and evaluation of the requirements and constraints affecting the solution; next, its solution for each requirement; and then the various stages of implementation and validation. It is in the area of constraint, recognition and evaluation that I will concentrate my remarks and for purposes of presentation I will divide these constraints into user, producer, marketing and external constraints. I do not propose to deal with other than the first two groups now, although any questions on the other areas are welcome.

As to user constraints, certain of these are simple, functional ones which are easily isolated and described. Since it is the user's activity that gives rise to the demand for information we need to ask what place the information has in the activity. The following questions need to be answered.

Who uses the information?
To what purpose is the information put?
In what form is it required, well presented or not, what degree of quality?
When is it needed, how often and for how long?
In what place is it used?
What precise items are required, accurate or approximate?
What is the acceptable, preferred and ideal time-lag between the request for and receipt of information?
How is the information used, in hand, as reference, in association with other information?
The user also has other requirements besides purely functional ones.
Irrational requirements are real enough to a user to affect his behaviour in relation to services.
Aesthetic preferences are justifiable and may strongly influence judgements.

The producer constraints include those presented by the systems and factors of production, which is something we do not have time to discuss, and the data that we use. The characteristics of the raw material, data, which are significant to the producer can be found by answering the following questions.

Is it available?
Do we already have it?
Is it expensive?
Do we control or have easy access to its source?
Is it easy to maintain?
Is it authoritative?

Is it accurate?
How much pre-treatment does it require?
Does it contain duplications?
Does it need to be complete?
Is it of a kind which can be used to manufacture other data?
Is it used only in association with other data or is it used by itself?
Is it often or seldom used?
Is it updated rapidly or does it turn over slowly?

Other factors such as the stock of programs, personnel skills and so on are outside this brief.

From the experience which we have accumulated the most important lesson we have learned is the one about retaining flexibility. The difficulty with real-time data structures is that they are on-going and their content is liable to change at any time, not only in terms of the values stored in given item locations but also in terms of an item's meaning or relevance. Whole concepts might be discarded or mushroom—especially at budget times. An inflexibly designed data library would be difficult, that is costly, or plain simply impossible to update. And an out-of-date real-time data base is a contradiction in terms.

Ways of achieving this flexibility might be as follows:

(1) *Giving perspective to the data under consideration.* In short, seeing of what whole it represents the part. For example, a file of metal prices must acknowledge that the London Metal Exchange formed only part of the commodity world. The methods of storage, presentation and updating should take into account such things as foreign exchange, bullion, foodstuffs and other raw commodities, freight rates and so on. It should take account of other domestic commodity centres, such as Liverpool, Bristol, and Dundee, and provide for data for foreign commodity centres which constituted world markets. Again methods must acknowledge that certain values are not derived on the bullring principle—sugar-price guarantees, common external tariffs, tobacco sanctions, coffee cartels, oil-price fixing and negotiated prices such as newsprint.

(2) *Spacing and placing.* The mere non-allocation of space can often be all that is required. The space does not have to be physical space, merely a coding arrangement in which enough codes are unallocated. (There is a further good reason for having highly redundant coding arrangements: if a code set, say, twenty-six letters, are all assigned the real practical danger will be that a mispunch gets through the screening and a gross error is processed in good faith.) It does not follow that physical space has to be assigned and zero padded. The ability to generate sufficient space at will, without program development, may be all that is required.

(3) *Duplication and redundancy.* This can lead to considerable flexibility. Again the ability to duplicate at will is what is really required in most cases. For example, it would be, and was, tempting to economize on storage by holding no sub-totals, reckoning that these could be easily calculated by a user program. When a set of data is acquired which has only the sub-total available (that is the components are not disclosed separately) the only course left is to enter the sub-total in one of the component slots.

(4) *Indivisibility.* The need for holding data in its most finely divided form can be important. Clearly, pursuing this goal could prove a costly exercise without proper evaluation of the benefits which might accrue from this atomizing process. As an example: we originally designed a balance sheet analysis which had a single item—total reserves. Under new structure designs eleven categories are defined (and an option to generate more if we need). The space to hold this detail is twelve times greater but no options are closed to the record's use. The eleven individual items can now be variously combined, just one combination being their summation. The data's potential has been phenomenally enhanced.

(5) *Tampering with the facts.* There is a tendency for the systems designer to accept a degree of clerical processing before data is actually acquired by his system. Most data needs a modicum of pre-treatment without which it is just not machine readable. But there is a considerable danger that in the attempt to erect a slick pro-forma approach the data is transformed. Perhaps all I am saying is that the world is sometimes complicated and do not try to fight it. One thing is for sure—if an acceptable pro-forma arrangement is derived it will not last long. We had the difficulty, for example, of providing for the various treatments by companies of cash grants. We were compelled by structures to adopt an across-the-board approach which though giving us consistency (which could have been achieved by good program design) has lost us the fact that this company chose to deal with things quite differently. There is also strong empirical evidence that the application of the pro-forma approach is more costly since non-specialist personnel can perform simple reportage with little training, while to fulfil the requirements of a pro-forma system requires the ministrations of an expensive specialist.

I was not sure at the outset whether a final note on some of the principles of program design, that is the logic area rather than the data area, might be appropriate. But I think that some of the reactions to what I have said so far indicate that these may be relevant to some of the audience's work.

Essentially, programs should be built from highly formalized and rigorously standardized components. Here is a piece from an internal report I prepared a little while ago which should lay the ghost of programming as a free-art form:

> 'A quick analysis of the functions of production programs shows areas of duplication unnecessary to efficient working. This duplication has gone on at all the stages of the production process. Duplicated flowcharts, coding sequences, punching, documenting, amendments, indeed there must have inevitably been duplicated errors. The use of standardized components which can be picked off the shelf in updated form must lead to economies all down the line.'

Next is the degree of generalization of a program's logic. (You can see how hard up we are for vocabulary.) The more generalized a program the greater the number of changes it can accommodate without being amended or substantially rewritten. There are some limits to how far this can go since in many cases this requirement can conflict with the need to segment into flexible components.

It turns out that experience indicates that a size of about sixty machine codes is appropriate to most functions. If less, the machine is preoccupied executing interfaces between components. If more, the human writing it finds is difficult to keep an overview in his head and thus makes mistakes or bad judgements. It also conveniently fits on a page of line-printer output.

Next is the strict maintenance of internal hierarchy. One program component may communicate with another at a lower level or with itself and must owe allegiance, as it were, to elements above. Thus logic is nested rather than webbed and is thus safely amended and readily modified just by pulling out the offending component and plugging in a fresh one. The hierarchy is maintained by having a strict interface, standard to all components, there being just one way to enter a component and only one way to get out. Strict interfaces also make systems easier to learn and operate and facilitate automated testing.

This kind of regimentation has one disadvantage: It is unspectacular.

DISCUSSION

MRS W. I. VEASEY (B. H. Blackwell) asked 'How many terminals are there and what is their geographical distribution?' MR DICKS replied 'There are 110 remote terminals connected to the central installation at present of which eighty-five are those of customers. The others are those needed by our control department to manipulate the data bank. Distribution is nationwide. We have had connections through to Zurich with perfect transmission experience. Continental telephone circuits are, or rather were, more modern than GPO facilities and though we might have trouble down to the Channel, European connections were perfect.'

DR T. V COE (ICI Paints Division) asked 'What time-slicing techniques are used to service customers "simultaneously"?' MR DICKS replied 'Most transactions are in computing terms trivial and thus accomplished by merely queueing and serially processing a list of transactions within each priority. The priorities are reviewed every time an "interrupt" of a certain kind occurs so orderly serial processing can take place. We do in fact practise time-sharing, that is having more than one program running in the machine at once, lower priorities being suspended until higher priorities are cleared or released. This practice does not seriously interfere with high-priority completion times provided lower-priority logic provides enough interrupts or release points. We have now developed, though do not use, a time-slicing technique whereby low-priority programs are sliced for 2½ minutes of configuration time. This kind of transaction is called into operation remotely. A further development is a locally originated time-sliced facility.'

DR COE also asked 'How was the data base designed and compiled?' MR DICKS replied 'The data base was originally compiled clerically for a limited list of companies—five hundred in all. By the time it was finished fourteen companies had been taken over or gone out of business, so the initial number was only 486. However, the updating procedures permitted data to be acquired relatively painlessly over time. The data bank now covers five thousand companies with twelve thousand plus stocks.'

MR B. BRIDGE (Scientific Control Systems Limited) asked 'Does the situation ever occur (depending on your method of updating) where, during the processing of a user's request, one of the factors used in that processing is changed by someone else?' MR DICKS replied 'Real-time processing carries with it the implication that data in use might be subject to amendment while a user program is running. We have certain data conventions which enable us to update records while preserving a frozen position. For example, we do not update the closing price of a stock before we close our files to the public though we might still have fed in the new closing price. The only other course is to play along with the facts, admitting that real-time work cannot be stopped and that if you just miss out on the substance of an update in a calculation that is too bad. There are particular difficulties associated with more than one priority having access to files for modification, that is an amendment might be lost if two amendments of different priorities are started in one order but completed in the reverse. But that is another story.'

MR A. LANGDON (Imperial Tobacco Group Ltd) said 'It seems clear that this system of information retrieval is too large and expensive for any one company to set up for its own use. The only feasible method is thus a co-operative venture supported by a number of subscribers. As has been explained, subscribers need their own private files as well as having access to the common stores of information. How then can it be ensured that there can be no cross-connections between terminals and the private files?' MR DICKS replied 'Particularly rigorous checks are applied to validate the credentials of an inquiry as it enters the network. Briefly the line on which the inquiry has come in, the machine which was used (a hardware generated code specifying the machine used is associated with the End of Message sentinel), the number of the customer and his private library are associated and the transaction further processed if all check out.

MISS N. M BROWN (W. Greenwood and Company) asked 'Apart from *Stock Exchange daily official lists* and profit and loss accounts, what other sources of financial information are put into the system?' MR DICKS replied 'The information sources are highly formalized for this type of application. There is a kind of organization (financial advertising agents) which supply a service to industrial companies distributing to the Press and agencies like ourselves information relating to their financial progress. These are hand delivered and go straight to our clerical process.'

MISS M. MORLEY (Morgan-Grampian) asked 'What is the cost to subscribers of this service?' MR DICKS replied 'The costs to subscribers vary with their degree of commitment but the average subscriber spends £5,000 to £8,000 a year with us.'

MR C. J EVE (Brixton School of Building) said 'As someone interested primarily in the aspects of information handling by computer rather than the subject matter of the data, in which directions do you think the system will develop? Which fields are you looking at?' MR DICKS replied 'I think the system will develop by taking us into the accounting side of financial institutions in line with the growing official Stock Exchange commitment in this area. I believe we will also broaden the base of our operation to the complete field of financial information. Some of these fields are surveyed and work programmes committed.'

MR T LANDAU (Inbucon Ltd) asked 'What is the content and cost comparison of SCAN with Moody's Exchange Telegraph services?' MR DICKS replied 'The card services which at present supply the financial information market cost upwards of £110 per annum to buy. We do have the technical capability to enter this field competitively so this is a matter of policy rather than a technical problem. There is a lot to be said perhaps for satisfying the same needs in a different way—perhaps by using present-day techniques.'

MR D I. MATHESON (Guildhall Library) asked 'Does your system provide capital gains tax computations, or would such a service be feasible?' MR DICKS replied 'Capital gains tax and estate duty calculations are virtually unprocessable or, rather, such systems to derive these values make assumptions which render the product useless for legal purposes. It is possible to have an infinite range of prices for the value of a shareholding on Budget day 1965 (a key value) and the correct value retrievable only by calculations requiring data for which there is no space to keep records, assuming there are records. The position is hopeless. I think it more likely that the law will be straightened out than computer systems bent.'

MISS H. R HIGGINS (Wellcome Research Laboratories) asked 'How many man-months of programming effort are needed to set up the system? How many programmers are maintained at present? What languages are used for programming?' MR DICKS replied 'There are basically two ways of getting computer systems running—by the "inspired individuals" method and by a rational process of industrial production. The former method often produces short-term results but longer-term nightmares. The original system was constructed by six people in six months. Because of commercial pressure it turned out less than perfect. Today the company employs some forty-five programming staff of which thirty-five are working on the configuration I have described, the others working on a new machine. All programs are written in an assembler language. Fortran is available but is wildly uneconomic for any job whose total run times exceed significantly the development time. The assembler language is called ART and though basic has sophisticated assembly time aids and is extremely economic.'

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ACCESS TO PRIMARY MATERIALS IN THE SOCIAL SCIENCES

JOHN E. PEMBERTON
University of Warwick Library

Paper presented at the first meeting of the Aslib Social Sciences Group, Tuesday 14th October 1969

I WANT to start by thanking the Committee for giving me the honour of presenting the first paper to the newly formed Aslib Social Sciences Group. This coincides with the uneasy lull between publication of the *Report of the National Libraries Committee*[1] and the Queen's Speech to Parliament. We do not know yet if the Government intend to legislate for the new national library structure which the Dainton Committee say we should have. What we do know is that a Dainton-based Bill might well turn out to be a lost opportunity for the social sciences.

The thing that shocked most social scientists in the Dainton Report was the statement in paragraph 229 that only subjects like science and technology, economics and management studies—subjects which it was said were important to the prosperity of the country—only these would be given comprehensive library and other information services. The social sciences in general were considered to be among those disciplines assumed to have a relatively low level of demand associated with a vast quantity of potentially relevant material. Those librarians who went to hear Dr Dainton talking about the report at Nottingham University last July were in for another shock. They heard him allude to his image of the social sciences being muddied by a considerable amount of ephemera. When I asked him why he and his colleagues had felt they were 'not qualified to identify the most appropriate answer' to the problem of how to deal with this type of material he pleaded, no doubt justifiably, that there simply had not been sufficient time to consider the matter in detail. Accordingly they recommended that the new National Library Authority should initiate discussions with other interested institutions 'in order [as they said] to establish the most practical and economic method of collecting and making available the primary literature necessary for research in the social sciences'.[2] All the same, one finds it hard to divorce the original premise of economic warrant from the conclusion that what the Committee itself referred to as an immense problem requiring to be tackled urgently was something that could safely be left to the proposed National Library Authority to sort out.

Let me hasten to say at this point that it is not my purpose here to be carping about the Dainton Report taken as a whole. Its main recommendations are to be welcomed and merit the strongest support for translation into legislative enactment. Such opportunities do not come round so frequently that they can be allowed to slip by unheeded and it should be our hope that reform of the national libraries, broadly on the lines of the Committee's recommendations, will be written into the Government's programme for the coming session of Parliament.

When we come to examine the proposals for social science materials in the light of all the evidence available to the Committee we can in fact derive a cautious optimism from them. After all, primary materials in the social sciences *were* recognized as a distinct and important category, heed *was* taken of the warning that documents are being irretrievably lost, and it seems likely that the Committee *would* have made a more positive recommendation for them if they had felt sufficiently qualified to make a choice between the alternative solutions which presented themselves. In the circumstances this was as much as we could reasonably have expected from an impartial body. The Committee's indecision is no more than a reflection of the disunity of opinion and conflict of interests it discovered in the evidence it received. If its members failed to give us what we wanted it is because they could not find out what that was. We must be grateful that Dr Dainton did not simply sweep our ephemera under the carpet of his new National Library Authority. In recommending that the new administration should take the steps necessary to find a solution he has given us time to take fresh stock of the problem and to work out a sensible and practical solution to it.

We really need go no further back than 1965 to find the source of our diversity. In that year the Committee on Social Studies, under the chairmanship of Lord Heyworth, suggested that a case existed for the provision of lending library facilities for the social sciences along the lines of those already provided for technology and the natural sciences by the National Lending Library at Boston Spa.[3] That might seem quite clear and unequivocal. What they did not make clear, however, was the type of material they had in mind. The NLL itself assumed that it was periodicals, since in his evidence to the Dainton Committee Dr Urquhart said that as a result of the Heyworth Committee's suggestion 'it was decided early in 1966 that the N.L.L. should collect *periodicals* in the social sciences on an "experimental" basis'.[4] The desirability of this course of action was never disputed—on the contrary, every encouragement has been given to the National Lending Library in this matter. Some would go as far as to recommend that the NLL should become the National Serials Library, with no subject limitation. It is in the bulk handling of periodicals that the Library has had such significant and welcome success. When in his evidence to the Dainton Committee the Librarian of the Board of Trade referred to the library at Boston Spa as a very successful warehouse[5] he was, whether intentionally or not, handing out a compliment. There is a national need for bibliographic warehouses: that is why the legal deposit arrangements were instituted in respect of the British Museum and other libraries of national importance.

Periodicals, however, are only part of the problem—and the easiest part to solve at that. Nothing at all has been done about that mass of so-called ephemera which is so important to research and which is so difficult of access. No one wishes to see the preservation of useless records, but one unfortunately encounters instances of the loss of unique archive material brought about primarily for reasons of space economy. On 22nd October 1935, for instance, the Treasury sent a circular to government departments stating that 'It appears to Their Lordships that a severe limitation of official papers selected for permanent preservation is desirable not only in the interest of economy in staff and accommodation but also with a view to preventing the mass of paper records from becoming unmanageable'.

But to return to the present, while the National Lending Library was taking a positive step to implement part of what the Heyworth Committee had recommended, another very important area about which they had expressed concern was apparently receiving scant attention—certainly as far as regards librarianship. I refer to the finding that many learned societies were in difficulties because they were losing their accommodation. There was apparently at that time some talk of a 'centre for human sciences' which would, it was hoped, house a number of homeless societies. But no one, it seems, saw any link between this problem and that of warehousing the invaluable libraries of those societies. By an unfortunate turn of events when libraries for the social sciences were again the subject of an advisory committee's investigations this was not in the wider context of social studies. It was, in fact, the Parry Committee on University Libraries[6] which reported in 1967 that was next to look at the problems of library provision. But if the fate of society libraries was not to concern them, they at least were aware of the existence and value to research of non-book, non-periodical literature. After agreeing with the concensus that the NLL should provide periodicals for the social sciences, they went on to observe that 'non-periodical publications, however, are of special importance in the social sciences, the literature of which is very complex'. The Committee even identified some of these publications. 'They embrace [they said] newspapers, news periodicals, pamphlet and broadsheet literature and a wide range of official and semi-official publications. These [they acknowledged] present special difficulties of handling and processing.'[7] In a sense, therefore, the Parry Committee made a significant advance by isolating primary materials from the rest. Though it is equally true to say that they marked time by failing to come to grips with the problem of providing them on a national scale. The Committee's chairman, Dr Parry, expressed his view to the Dainton Committee that one of the most desirable functions of a British National Library would be the improvement of lending facilities in the social sciences.[8] If only he had been more specific in his recommendations. Would he have suggested a national collection for primary materials? In his letter to Dr Dainton he said he fully endorsed what was said in the memorandum submitted by SCONUL[9]; but one will search the evidence of that body in vain for any mention of research materials in the social sciences.

More might have been expected from the Social Science Research Council, whose Charter requires it, among other things, to encourage and support by any means research in the social sciences, and to provide and operate services for common use in carrying on such research. Their assessment of the present situation, however, was that the national holdings are tolerably complete and that all the user needs is 'some expertise in search'.[10]

Perhaps, then, the problem of providing research materials in the social sciences is not as urgent as the Dainton Committee believe. Perhaps they have been misled; perhaps, after all, the social scientist really has no difficulty in locating and getting access to primary sources.

If there is no such difficulty, why should a university lecturer write to me and say 'The whole documentation problem is one that we all regard as central for the future of the Graduate School', and that they 'regard the possibility of a national collection as a godsend'? Why should a university professor and member of the Social Science Research Council write and encourage me to give what he calls 'stimulus to the discussion of the problem'? Any discussion of the problem so far has been marked by its paucity. Yet there is the SSRC itself giving, for example, over £2,000 to the secretary of the Scottish Labour History Society to track down and list trade union records in Scotland before they disappear.

Here I return to my point about learned societies losing their accommodation. When accommodation is lost or when space is required for other purposes records are discarded. Too many people regard them as dispensable for our peace of mind. And if those of our academic colleagues and other social researchers who suffer from these losses are slow to complain it is not always through apathy. Frequently one hears of individuals having to preserve for posterity invaluable materials which have been earmarked for disposal. The reader in social history in my own university told me recently of a case in which he was involved some fifteen years ago. A friend had telephoned to say that the papers of John Fielden, the well-known factory reformer, were stacked by the door of the librarian's office in his local public library awaiting the refuse collectors. Through the efforts of my then impecunious colleague, who managed to buy a few items for himself and to persuade another library to acquire some others, a fair proportion of the collection was saved. Even so, much was lost for ever. I know too from personal experience that irreplaceable material is constantly being discarded. Every day the toll is mounting and will continue to do so until an effective warehousing operation is put in hand.

When I accepted the committee's invitation to give this paper I did not expect the bonus of having the written evidence of the National Libraries Committee to draw on. Little did I know that the National Lending Library for Science and Technology was to support several of my arguments for the creation of a National Documents Library. I have written elsewhere[11] that such a library would attract considerable deposits of literature, and by virtue of its holdings affect the acquisitions policies of individual libraries and thus afford a substantial overall saving to the nation. I now learn that the NLLST receives as gifts from other libraries 'on average about one ton of literature per week'[12]. Further, it is stated in their evidence that the library has some direct economic value in '(*a*) making it unnecessary for other libraries to purchase, record and store material which will be little used, and (*b*) making it unnecessary for other libraries to continue to store material after it has passed its use peak'[13]. It is logical to expect that not only libraries but also individuals—and I am thinking here of public figures, MPs, councillors and so forth—would welcome the opportunity to deposit in an appropriate library precisely that kind of fugitive and often ephemeral material which is basic to research in the social sciences. A group under the chairmanship of the Warden of Nuffield College is at present surveying the field of private archives of recent and contemporary public figures, and it might significantly affect their rate of success in preserving this kind of collection if they were able to offer deposit facilities in a national library. This notion is supported by the Department of Education and Science who, in their evidence, talk about 'rare items that are now privately held for want of a suitable home'[14]. Would they not consider a National Documents Library the most ideal of homes? The alternative they suggest is a network of specialized collections. Yet in their own list of the main libraries with substantial reference collections in Central London, out of fifty-seven entries only seven are stated to be open to the general public for reference and research.[15] And this list takes no account of the smaller, but none the less important libraries of associations and learned societies which are intended for members only. Little wonder, then, that the Social Science Research Council were of the opinion that researchers needed 'some expertise in search'.

It might be worth pausing here to consider just one source of literature—the files of Members of Parliament. They surely are capable of conveying the current of social thought across the years. Think of the letters MPs receive from constituents about topics of vital interest to them. There is little else, save perhaps letters to the Press, that can provide such an accurate picture of public reaction to parliamentary legislation. Think of the pamphlets they receive from pressure groups, from nationally organized societies for the presentation of this or that to the local action committee formed by a number of local tradesmen. Think of the exhortations they receive from lobbyists to support one Bill or kill another; the cordially worded internal memos from colleagues inviting their backing for a certain motion; the copies of their own campaign literature, and that of their opponents; the manuscript notes on agenda sheets; the speeches they give whose message is not recorded anywhere else. I would suggest that such files would clothe the bones of all your opinion polls and would afford to those who study society a far more accurate view than any set of statistics.

We should beware of subordinating qualitative accounts to quantitative data. If we think too much in terms of feeding bits of information into computers and strive always to reduce society into a set of statistics we shall develop a sort of data mania. Somehow efficiency seems always to be expressed in economic terms and the corollary to this in many people's minds is that something that cannot be reduced to binary arithmetic cannot therefore be made efficient.

In any case, the notion that society wants something other than efficiency at all costs is one which finds expression every day in the national Press. It is perhaps epitomized in the Stansted Affair, where human attitudes for once, if only for a time, have triumphed over cost/benefit analysis. Giving evidence to the Estimates Committee's Sub-Committee on Economic Affairs, Professor Richard Stone (an economist) stressed the danger of relying solely on economic approaches to the solution of the country's problems. 'It seems to me [he said] many economic problems end up in one of these social problems, they end up in social attitudes to innovation, to mobility, to restrictive practices, and so on. Unless you can cope with those [he went on] there is a sense in which it might be said that the economic solution will not in fact succeed'[16].

Part of the success of economists in exerting a disproportionate influence on the nation's decision makers is due to the enormous capacity for the generation, storage and retrieval of data that has become available to them by way of electronic computers, and due also to the powerful new mathematical techniques such as econometrics with which they have been equipped. If the social sciences, which have benefited so considerably in recent years from an increased use of quantitative analysis, are to prevent the nation from falling victim to technocracy they must seek means by which they can add a greater measure of human values to the scales.

Technocracy must be balanced by sociocracy. There is more to planning than making models of economic systems. Hugh Stretton in his book *The Political Sciences*[17] has something relevant to say on the subject of quantification in the social sciences:

> 'Careful observation does not always mean the mechanical measurement of qualities (though that is one very reliable kind of observation). It depends obviously on what has to be observed. The nearest available quantity may not be the most objective indicator of a quality or a passage of human thought and feeling, even though it produces the most unanimous observations. It may unhelpfully report something where understanding or impression would report the true object more faithfully.'

It must be recognized that the economic well-being of the country which Dr Dainton seeks cannot be achieved in a climate of social discontent. The Fulton Committee on the Civil Service has seen the need for a new class of social administrators whose training, they say, should include 'methods of social investigation and the technique of collecting and analysing information commonly used in public and private inquiries into social problems'[18]. To deprive them of the fullest library and information services would be like asking a doctor to get by with a bandage and a bottle of aspirin.

It was a different matter when the scientists needed our help. In 1954 the Advisory Council on Scientific Policy saw an efficient library service as 'a major factor in scientific and technological progress' and recommended the creation of a national science lending library[19]. What resulted was the National Lending Library for Science and Technology at Boston Spa, whose 3,100 approved industrial, research, academic and other borrowers in 1968 made more than 700,000 loan requests.

Are we now to assume that after the scientists and technologists the next in line to solve the nation's problems are the economists and students of management? If we look in this as we do in many other matters to the United States for an example we find that the National Science Foundation restricts its financial support in social science subjects to what its Director calls 'the proportion of research that is objective, independently verifiable, and subject to useful generalization'[20]. But then the United States still has its social problems.

The matter of social science is not as amenable as that of pure science to reduction into so-called 'data'. Even social surveys are not intended solely to produce facts—they are often equally used as a means of engaging the interest and enthusiasm of members of society into the objects of their inquiry. In his book *The Tools of Social Science* John Madge[21] says that 'in no science is the pursuit of objective knowledge more futile than in social science'. Our subject is not value free—the social scientist's work has to be related to the social environment within which he is working. The MP's correspondence is worth much more to us than the record of how he has voted in the House.

What then can we do to ensure that the documentary materials of research in the social sciences are preserved and access to them guaranteed? Should it not be one of the primary aims of the new Aslib Social Sciences Group to work out a strategy to achieve this? Perhaps I might briefly discuss one or two possibilities and invite your discussion of them later.

When the Dainton Committee spoke of the urgent need to tackle the problem they used the word 'co-operatively'. And in their recommendation they suggested that the new National Library Authority should discuss the matter with other interested institutions.

Co-operation is all very fine—when it can be made to work. Mr Richnell has recently written about the funds made available by the Government to certain universities for the development of Latin-American studies. 'Part of this money [he writes] is devoted to building library collections, but [he goes on] it is quite inadequate to provide anything like comprehensive coverage, and [this is the important part] a complex machinery of committees and union catalogues is growing up to cope with the inadequacies'. Richnell has no doubt that 'Comprehensive coverage can only be satisfactorily achieved by a single authority with the resources to employ enough specialists in the field to acquire the material'[22]. In recommending that the scheme for co-operative acquisition should be replaced by an operation mounted by a single authority, he makes the valid point that 'Other libraries could then plan their acquisitions in the knowledge that one copy of all material was available in the national collection. This [he writes] would be both practicable and in the long run economical'[23]. Aslib, too, this time referring to foreign material in their *Comments on the Dainton Report submitted to the Secretary of State for Education and Science* have this to say: it is 'pointless to depend upon co-operative schemes'. And they give two main reasons: (i) 'because the individual needs of libraries change', and (ii) 'because responsibility for acquisition "by subject" or "by country" is too haphazard'[24].

Aslib also say, with reference to a national loan collection, that there exists 'a strong case for a national repository in a low-rental area to which libraries should be encouraged to send low-use material in the knowledge that it would always be available for loan. Such a repository [they say] could prevent the growth of local and regional repositories and could also save library space in high-rental areas'[25].

This, I would suggest, should be a cardinal principle—that co-operation in the acquisition of primary materials in the social sciences should be based on the creation of a national collection. Such a collection could be called the National Documents Library.

In the first instance this would be a joint deposit library, holding that material which other libraries find to be of low use and/or which they no longer wish to retain themselves, for any reason. Against such a collection individual libraries would be better able to work out their own acquisitions policies. Furthermore, they would undoubtedly divert to this collection potential gifts which might well otherwise be refused and consequently destroyed. People who have documents to dispose of frequently offer them to the nearest library. If accepted they are equally often a source of local embarrassment; if declined they are a national loss.

Secondly, this library would bid for records which come on the market on behalf of the whole community. At present a good deal of bargaining goes on between publicly financed institutions for documents offered at auctions, and when HMSO ask for bids for surplus official papers these same libraries bid not only against the booksellers but against each other as well. It would seem to be absurd for one university library to bid against another through nominated agents and succeed only in pushing up the price the other has to pay. This is not to say that the national library should outbid them both. Official papers would automatically be offered to it first; and in the case of the commercial book trade there would be many instances where individual libraries would be happy to leave the field to it.

Thirdly, by virtue of its national status a central collection would attract deposits of current literature, both domestic and foreign. In the knowledge that its stock would be available nationally all manner of societies, trade unions, political parties, pressure groups, employers' associations, official offices and quasi-official bodies would be willing to donate their published and unpublished literature.

Fourthly, the National Documents Library would maintain a register of collections in other libraries and in the possession of individuals. The Historical Manuscripts Commission is already doing a useful job as regards manuscript material with its National Register of Archives and as manuscript records are often found in the company of printed records there would need to be close collaboration here.

It must be stressed that it would not be an object of the proposed library to set out deliberately to duplicate the stocks of the numerous special libraries up and down the country. But it would certainly be its job to know about them, and particularly to know the degree of their accessibility.

It is not difficult to predict that at some time in the future a working party will be set up by some national library authority to look into the problem of access to primary materials in the social sciences. Between now and then it behoves our library profession to formulate a commonly agreed policy which can convincingly and confidently be promulgated. And in this I urge the newly formed Aslib Social Sciences Group to give an enthusiastic lead. Even more earnestly I would urge them to press for a National Documents Library.

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Recent additions to the Aslib library catalogue are broken down into twelve broad groups, whose coverage is indicated below. These groups are not mutually exclusive but it is hoped that users will find them helpful in scanning for new items of interest.

Note:—These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory.

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres; management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

ELIZABETH MACK
Head of Library and
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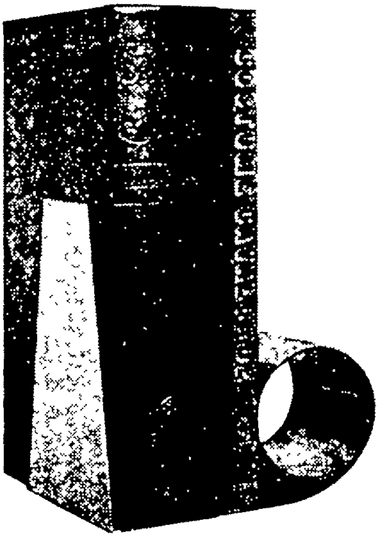

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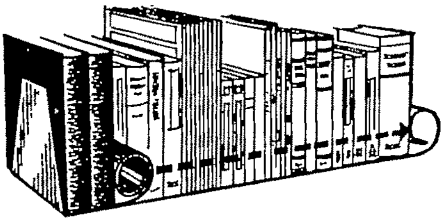

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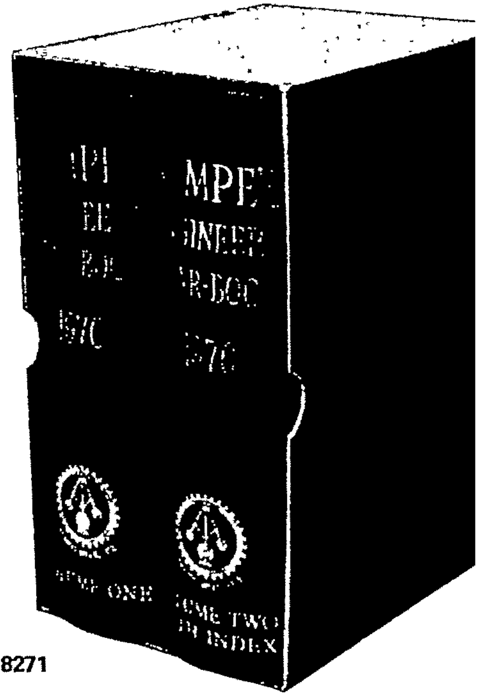

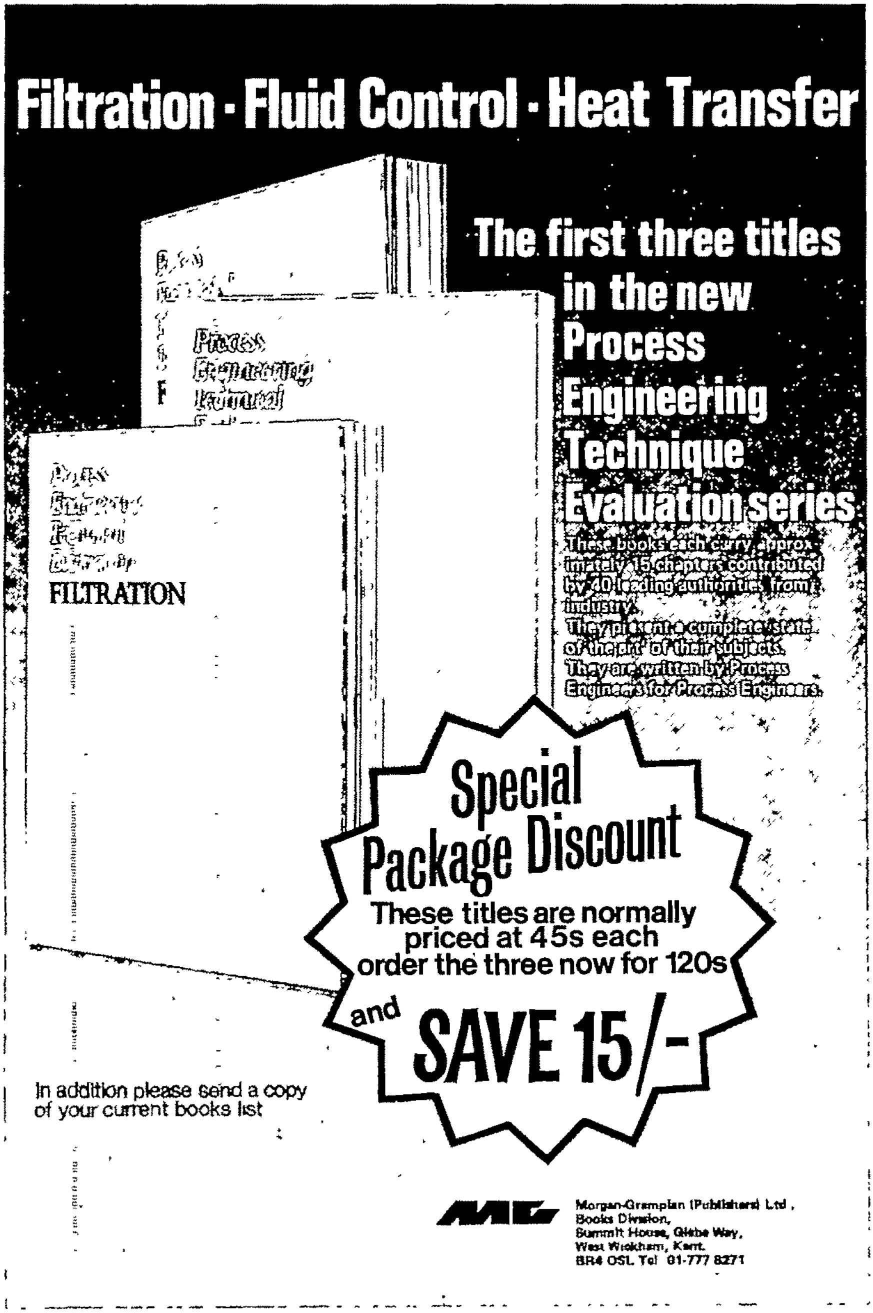

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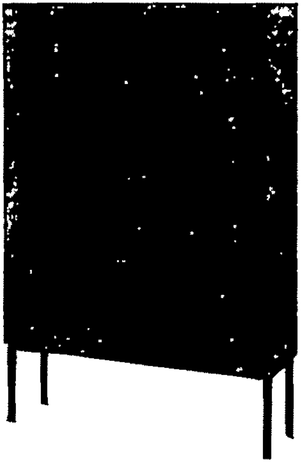

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ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 22 **February 1970** **Number 2**

ASLIB CALENDAR 1970

March

WED.4.	One-Day Conference on In-Training of Library and Information Staff. Imperial College, London.
FRI.20.	Scottish Branch Annual General Meeting and Conference. Stirling.
MON.23.	Aslib Co-ordinate Indexing Group Annual General Meeting and Discussion. Aslib. 2.30 p.m.
TUE.24.	Aslib Midlands Branch Annual General Meeting. Followed by talk: 'Unco-operation by, and between, librarians and information scientists' by Dr D. J. Campbell. Arden Hotel, Birmingham. 6.15 p.m.
WED.25.	Evening Meeting. Plans for a new system of business statistics. Speaker: M. C. Fessey (Business Statistics Office). Imperial College, London. 5 for 5.30 p.m.

April

WED.1–FRI.3.	Aslib Chemical Group Course: Basic Chemistry. Courland Grove Hall, Wandsworth, London SW8.
WED.8.	Aslib Chemical Group Annual General Meeting and Annual Lecture: 'The oracles of the technological era' by E. F. Parker. Ivanhoe Hotel, London WC1. 11.15 a.m.
FRI.10–SUN.12.	Aslib Aeronautical Group Conference. Cranfield.
WED.22.	4th Aslib Annual Lecture by Professor J. M. Ziman, FRS: 'The light of knowledge: new lamps for old.'
THU.23–SAT.25.	Aslib Joint Northern Midland Branch Conference. Derwentwater Hotel, Portinscale, Keswick.

May

TUE.19.–WED.20.	Aslib Open Days. 3–6 p.m.

June

TUE.2.	Aslib Open Day. 3–6 p.m.
WED.3.	Aslib Annual General Meeting. 11.15 a.m. Open Day. 3–6 p.m.
WED.10.	One-Day Conference on International Developments in Scientific Information Services. Royal Society, London.

Aslib research during 1969

The Aslib research programme for 1969–71 was published in the July 1968 issue of *Aslib Proceedings*. Following the lines laid down by Council, the aims of the Research Department are, first, to increase its technical competence in matters where an advisory and consultancy service is called for, and second, to make a contribution to background research.

Advice and consultation are needed in two directions. There is a growing demand from member organizations of Aslib. During 1969, the Department carried out studies for members on their information service requirements, library accommodation, classification and indexing, re-cataloguing and other problems. Clearly, to carry out this form of consultancy successfully requires a continually deepening understanding of the problems of the special libraries that largely make up Aslib membership.

There is, however, another demand for development work. An appreciable number of the special projects commissioned by OSTI are concerned with the needs of particular organizations. These may on occasion be large organizations, with problems more complex than those of the typical special library. The Department must therefore become familiar with techniques for the analysis of large systems, techniques that may seem over-elaborate to some Aslib members.

The 1969–71 programme set out half a dozen general areas of activity. Some of these have been held over for study in 1970, some have made good progress, and others have not been as successful as was hoped.

'Further involvement in the development of mechanized information operations' was the first activity proposed. This has been achieved at several levels. Using Aslib equipment, a detailed study has been made of how to exploit punched tape and machine-sorted punched cards in the special library. A report is in preparation, examining the use of these in such processes as ordering, cataloguing, listing and loans.

Work has continued at the Atomic Energy Research Establishment on the development of a computer-based system for recording library loans. At the South Eastern Regional Library Bureau, a computer-produced location list, for which the program was written by Aslib, has been in trial use. For some time, work has proceeded on the writing of a complex suite of programs by which the Aslib *Index to Theses* could be typeset: this has had many setbacks, but its completion is now in sight.

The main mechanization project of the year has been with the Commonwealth Agricultural Bureaux. The Department is studying the feasibility of preparing machine-readable records of abstracts, from which the many journals of the Bureaux could be computer-typeset, subject indexes printed and searches carried out. A great deal has been learnt about possible computer configurations and costs, and about the problems of a decentralized organization.

In a second area, 'the study of information needs', the Department has been less active this year. An analysis has been made of the geographical distribution in the U.K. of science/technology/medical/agricultural libraries, in relation to the distribution of potential users. We have begun a study on the use of data by chemists and physicists. There is not much detailed evidence available on this problem, and we are feeling our way with a pilot survey.

'The evaluation of library and information services' is a general area in which some progress has been made, and many problems uncovered. Evaluation includes the study both of effectiveness (how useful is the service) and efficiency (how economically is it performed), and leads on to a study of cost/effectiveness. One substantive investigation was carried out in this area—a study of the workings of specialized information centres serving a scattered audience, from which a guide to the development and operation of such centres is being prepared. Other time has been devoted to trying out various systems analysis techniques in large libraries. Much has been learnt, but no decisive contribution to evaluation has yet been made.

A further area proposed in the 1969/71 programme was 'the development of optimized systems'. It has been hoped that a study of clerical processes in university libraries would lead to some progress here, but this has not been achieved. More confidence is felt in an investigation into the uses of bibliographic records in various types of library. Library procedures associated with forms have been analysed, and the elements of bibliographic and administrative data needed in each procedure have been isolated. The procedures have been built into a model system, and this has been used to throw light on the workings of an actual library.

An area of work not specifically foreseen in the 1969/71 programme, although it enters as a detail into other areas, was the study of retrieval languages. The role of classification in current science information, and its potential in a world science information system, were explored for the International Council of Scientific Unions. Classification and coding of data for the construction industry was investigated for the Ministry of Public Building and Works. The subject indexes of the Commonwealth Agricultural Bureaux have presented many problems. A manual on thesaurus construction has been drafted, and a textbook on techniques of information retrieval is in the press.

The year has been a busy one for the Research Department. A wide range of work has been undertaken, and our technical competence has indeed increased. Even from those projects that did not attain their full objectives we have learnt much. We believe that the Department has given practical advice to many organizations, carried out some useful background investigations, and developed successfully in the way that Council requires.

B. C. VICKERY
Assistant Director (Research)

Fourth Aslib Annual Lecture

Aslib's fourth Annual Lecturer will be John Michael Ziman, FRS, who has been Professor of Theoretical Physics at Bristol University since 1964. Educated in New Zealand and at Balliol College, Oxford, Professor Ziman was a lecturer in mathematics and Pressed Steel Research Fellow at Oxford University. For ten years he was a Fellow of King's College, Cambridge, where he became Tutor for Advanced Studies and where he edited the *Cambridge Review*. In 1968 he delivered the Rutherford Memorial Lecture in India and Pakistan. He has given a good deal of thought to the role of scientific information and the processes whereby the results of research become public knowledge. For Aslib members on 22nd April, in the William Beveridge Hall, University of London, he will look ahead to some future methods and problems under the title 'The light of knowledge: new lamps for old'. The lecture will begin at 6 p.m.

Junior and Senior Introductory Courses

It is planned to hold the Junior Introductory Course to Special Library and Information Work in London in February, April, June, September and November 1970 and if possible in Manchester in May and in Glasgow in December. It will greatly facilitate forward planning if members who might send staff on either the Manchester or the Glasgow course would inform the Education Officer, Aslib, as soon as possible. Because of the demand for the London courses, bookings cannot be accepted before printing of the programmes. Advance copies are sent to members who have previously applied unsuccessfully or who have asked to be notified.

Senior Introductory Courses, for graduate staff who have recently taken up information work, are planned for London in March and October. The same remarks about bookings and advance copies of the programme will apply as for the Junior courses.

Chemical Group AGM

The annual general meeting of the Chemical Group will be held on Wednesday, 8th April at the Ivanhoe Hotel, Bloomsbury Street, London WC1 and will begin at 11.15 a.m. This will be followed by lunch and at 2.45 p.m. by the Annual Lecture. The speaker this year will be Mr E. F. Parker, a British director of the Hercules Powder Company Limited and an expert on technological forecasting. Speaking on 'The Oracles of the Technological Era' Mr Parker will give a brief critical review of the various approaches to technological forecasting and the problems for which each is best suited. This will lead up to a fuller account of experience with the Delphi method itself, and the whole paper will have specific reference to the chemicals industry. There will be an opportunity for questions and discussion afterwards.

Further information can be obtained from the secretary of the Group, Mr Barry Langton, County Technical Librarian, County Library Headquarters, Goldlay Gardens, Chelmsford, Essex.

Midlands Branch

The Annual General Meeting of the Midlands Branch will be held on Tuesday, 24th March, at the Arden Hotel, New Street, Birmingham. After the business meeting Dr D. J. Campbell will speak on 'Unco-operation by, and between, librarians and information scientists'. Following this a buffet will be served.

Library Research Methods

A two-day seminar on library research methods, organized jointly by Aslib and the Library Association, was held at Library Association Headquarters on 10th and 11th December, 1969 and was attended by nearly forty people. In recognition of the volume of research at present going on in schools of librarianship (and which seems likely to grow considerably) the seminar was aimed principally at library school teachers who will be increasingly responsible for conducting research. The papers and discussion ranged widely over the whole field of library-related research, but centred on the methodologies used in studying, respectively, documents, people and their interaction on libraries, and systems and processes. Papers were given by twelve speakers actively engaged in research who in some instances used a case-study approach to illustrate particular methodological problems.

As this seminar was the first of its kind the approach to it by the organizers was necessarily experimental. Useful lessons were learned and it was encouraging to note a generally expressed view that further seminars should be held more closely confined to specific points of library research methodology treated in greater depth than was possible on a mainly introductory occasion. The case-study approach was found generally helpful and amongst other points of interest raised by participants were: the possibilities of a data bank for library and information research; the needs and future pattern of such research as a subject for seminar-type discussion; the dichotomy between applicable research results on the one hand and 'pure' research on the other (i.e. where practically applicable results cannot immediately be seen); reading lists, on research methods, for library school students.

New Year Honours List

Members will be pleased to learn that the following people associated with Aslib have been honoured in the New Year Honours List.

Miss L. V. Paulin, Hertfordshire County Librarian: O.B.E.

Dr D. J. Urquhart, Director, National Lending Library for Science and Technology: C.B.E.

Harold Leslie White, National Librarian, National Library, Canberra: Knight Bachelor (Commonwealth of Australia List)

Handlist of basic reference material for librarians and information officers in electrical and electronic engineering. 5th ed.

A reprint of this publication, compiled by Ellen M. Codlin and R. S. Lawrie is now available, at 25*s* (15*s* to members of Aslib). Orders should be addressed to Mr G. J. Bontoft, Hon. Treasurer, Aslib Electronics Group, Craneside, Woolstone, Cheltenham, Glos., and cheques and postal orders made payable to Aslib Electronics Group.

Dewey Decimal Classification Sub-Committee

This recently reconstituted Sub-committee of the Library Association's Research and Development Committee has been considering the area of its activity in close co-operation with the Decimal Classification Division of the Library of Congress and with the Forest Press, the publishers of the Dewey Decimal Classification.

It has been agreed that the objectives of the Sub-committee should be:

(i) Encourage discussion and comment on DC in Britain and act as a channel of communication between the United States and Britain on all aspects of DC theory and practice.

(ii) Receive and co-ordinate comments from British librarians for despatch to DC.
(iii) Formulate criticism on topics of British interest present in the Schedules.
(iv) Gather information on inconsistencies in the operation of the Schedules.
(v) Advise DC on matters of general policy in so far as they reflect British attitudes in the study of classification.
(vi) Assist in the preparation of interpretative and instructional aids and manuals for British users.

The Sub-committee has received copies of the Draft Schedules of 18 DC and has asked specialist librarians to study certain areas in relation to British needs. It is anxious that British terms be included in the Schedules and in the Index wherever there arises the possibility of confusion amongst British users through the sole use of American terms.

The production of 18 DC has reached an advanced stage and it is unlikely that British views can have much effect upon its final appearance, though it is expected that the Sub-committee may make an effective contribution to the preparation of 19 DC.

Our American colleagues are as anxious as the Sub-committee to see the fruits of this new relationship. Its success depends as much on the representations made to the Sub-committee by British librarians as upon the spirit of co-operation evinced by DC authorities. The Sub-committee therefore appeals for information on the use of 17 DC particularly, and also upon the use of earlier editions. Offers from specialist librarians to review particular areas of the Draft Schedules would also be appreciated. The Sub-committee would be happy to make available for consultation the copy of the Draft Schedules it has received. It must be borne in mind that there may be further alterations before final publication as the Drafts are still subject to amendment. Communications, official or unofficial, can be addressed at any time to the Research Officer, The Library Association, 7 Ridgmount Street, London WC1.

The constitution of the Sub-committee reflects the interests of libraries, of professional education and of commercial services. Though the problems of each of these agencies may be different and may require advice and solution in different ways, it is felt that all of these must be resolved on the basis of a coherent view of the classification.

With the object of co-ordinating comment throughout as large an area as possible the Sub-committee has been in communication with the library associations of other British Commonwealth countries.

Copyright Law and Practice

A series of four lectures on American, Commonwealth and Continental Copyright Law and Practice will be presented by the Graduate Business Centre of The City University, commencing on 3rd March 1970, from 6.00–8.00 p.m. They will take place at The Graduate Business Centre, The City University, Gresham College, Basinghall Street, EC2. Further enquiries should be addressed to the Course Organizer at this address.

MARC II Special Institute

The Information Science and Automation Division of the American Library Association and the Information Systems Office of the Library of Congress will be holding the second in a series of MARC II Special Institutes from 16th–17th March 1970, at the Shoreham Hotel in Washington DC. Delegates will hear and see the latest work of the staff at the Library of Congress on the MARC II magnetic tape service.

Both an introductory and an advanced session will be held on the first day, the first describing the MARC System, including input procedures, codes, format, etc., while the second will deal with the actual workings of the System. This will include sorting, print and retrieval programs, the project to transfer work of the MARC editions to machine processing, and the RECON project.

On the second day librarians will speak on their everyday experiences of using the MARC II format and tape service.

Further details can be obtained from the Marc II Institute—Washington, American Library Association, 50 East Huron Street, Chicago, Illinois 60611.

National Federation of Science Abstracting and Indexing Services (NFSAIS)

'Changing roles of information services' is to be the theme of the 1970 Annual Conference of NFSAIS to be held in Boston, Massachusetts, on 10th–12th March. Invited speakers will discuss changes that can be foreseen for primary journals, secondary services, library networks, information analysis centres and information dissemination centres.

International activities will be reviewed by Madame Jeanne Poyen, General Secretary of the International Council of Scientific Unions/Abstracting Board and Scott Adams who is working on the UNISIST programme (see *Aslib Proceedings*, February 1969).

Further information can be obtained from the National Federation of Science Abstracting and Indexing Services, 2102 Arch Street, Philadelphia, Pennsylvania, 19103.

Chemical Notation Association

The UK branch of the Chemical Notation Association (CNA), a chartered body originating in the USA, held its inaugural meeting on 11th November 1969 in Loughborough, attended by twenty-five scientists representing twelve industrial and university organizations. The Association exists to promote research and development in the field of chemical notation systems.

The main concern of both the scientists and the CNA is the application of the Wiswesser Line-Formula Notation (WLN) for the processing and retrieval of chemical structural information. WLN is a system for converting chemical structural diagrams to a linear string of symbols. The resulting notation is a one-dimensional representation of the two-dimensional chemical structure, suitable for manual, mechanical, or electronic processing. Retrieval of structural information can be achieved via computer-produced simple or permuted indexes of alphabetically arranged notations.

The Chairman of the new CNA (UK) is Mr Ernie Hyde of the Data Services

Section of ICI Pharmaceuticals Division. Further information about WLN or CNA can be obtained from: CNA (UK), c/o Mr Graham Palmer (Secretary), Chesterford Park Research Station, Saffron Walden, Essex.

The Soviet Chemical Industry

We have recently received the first two issues (No. 7, July and No. 8, August 1969) of a cover-to-cover translation of *Khim. Prom.* (Khimicheskaya Promyshlennost'), the official journal of the chemical industry of the USSR. Entitled *The Soviet Chemical Industry*, these translations are published by the Ralph McElroy Co., Inc., of Austin, Texas. Each issue aims to provide all the information in *Khim. Prom.* to subscribers within one month of receipt of the Russian original. Further details and subscription rates can be obtained from the publishers at 504 West 24th, Austin, Texas 78705, USA.

Computer-aided Design Committee (CAD)

In its Second Annual Report, published on 19th December 1969, the Computer-aided Design Committee of the Ministry of Technology emphasizes the importance of the development of information collection and retrieval for engineering design.

This can be seen from the details, included in the Report, of the activities and recommendations of the Information Collection and Retrieval Sub-Committee of the CAD which was set up to consider the requirements for the collection of engineering data and for making such data available for the purposes of computer-aided design, and to make proposals for projects in this field.

The Report records the second year's work of the CAD up to April 1969. The Committee has since held two further meetings and has now completed its work. Copies of the Report can be obtained from the Systems and Automation Division, Ministry of Technology, Room 219, Dean Bradley House, Horseferry Road, London SW1.

Libraries in New Towns Group

At a meeting at the Public Libraries Conference at Southport in September it was decided to proceed with the formation of a group to deal with problems relating to the development of libraries in new towns. As a result a 24-hour workshop for preliminary discussion on the future of the group will take place on the 11th and 12th March 1970 at the Grafham Water Residential Centre near Huntingdon. The Director of Studies will be Mr Donald Kennington, FRSA, ALA, Chief Information Officer at the Greater London Research Library. Further information can be obtained from Mr Barry Hall, City Librarian, Central Library, Broadway, Peterborough.

Central Patents Index

A new patent information service known as the Central Patents Index was introduced in January this year by Derwent Publications. It covers chemical and chemically related patents issued in the leading fifteen patent-granting countries, including the USA, UK, Germany and Japan, and comprises current awareness and abstract publications. It is also designed to incorporate previous patent documentation services, PLASDOC (Plastic and Polymer Patents), FARMDOC (Pharmaceutical Patents) and AGDOC (Agricultural Patents).

Further details can be obtained from Derwent Publications Ltd, Rochdale House, 128 Theobalds Road, London WC1.

Engineering Index Inc.

CARD-A-LERT is a redesigned and reorganized version of EI's former 'Card service'. It is divided into 167 technical 'Divisions' so that engineers need only subscribe to the Division or Divisions corresponding to their technical work. Abstracts for each Division are selected from the sixty thousand produced annually by Engineering Index and the articles abstracted are available from the Engineering Societies Library for a small charge.

CARD-A-LERT also adds new Divisions to the existing ones, as, for example, in the fields of air and water pollution, space physics, computers, lasers, nuclear and plasma physics, etc.

A catalogue giving full details of the service is obtainable from the Marketing and Business Services Division, Engineering Index, 345 East 47th Street, New York, NY 10017.

BRIEF REVIEWS

BRITISH MUSEUM. Periodical publications in the National Reference Library of Science and Invention. Part 1: List of non-Slavonic titles in the Bayswater Division. London, 1969. 289 p. 25*s* (SBN 7141 0287 3).

This is the first published list to appear of the holdings of the Bayswater Division of the NRLSI. The Division is a library of material on the life sciences and also on the physical sciences where the link with invention is not strong, e.g. mathematics and geology. Photocopies can be provided quickly within the limitations of the Copyright Act. Orders for photocopies of publications in the Bayswater Division should be sent to the Holborn Division; alternatively a while-you-wait service is provided at the Bayswater Division.

Nearly eight thousand periodicals are included in this list which is alphabetical by title and shows holdings of both current titles and closed sets. Classmarks are given: the old Patent Office Library classification scheme has been used with some alteration. Each journal now has a unique classmark which also indicates the predominant language of the text and whether or not the publication is an abstracting journal.

This catalogue is an extremely useful guide to the periodical holdings of an extensive collection of publications of which both libraries and the general public are not fully aware.

BULLETIN SIGNALETIQUE 101. Information scientifique et technique. Paris, CNRS, 1970—

This new section of the Bulletin has appeared as a sample issue No. 0. It is arranged in four large groups (each further sub-divided), based on a classification and indexing system (Lexique documentaire) developed by the Groupe d'Étude sur l'Information scientifique associated with J. C. Gardin. Like the twenty-six other monthly abstract sections covering science and technology (there are nine quarterly sections for the social sciences and the humanities) the abstracts are only indicative. This abstracting service is computer-produced and printed as 'all caps'. It has an author index, and a subject index, both in French and English. The headings for the English index are also based on the Gardin system. An interesting addition is a special index which lists work done in French organizations.

DEUTSCHE GESELLSCHAFT FÜR DOKUMENTATION. Bibliothek und Dokumentationsstelle. Deutschsprachiges Schrifttum zur Dokumentation. German language literature on documentation. Frankfurt-am-Main, 1969. 32 p. DM 290.

This is a bibliography of German language literature in the field of documentation and information work for the years 1960–9. There are about 550 items including monographs, reference works, series and periodicals. A few periodical articles are also included. The monographs are arranged by subject and the others according to form divisions with a general subject index to the bibliography as a whole. All items listed can be borrowed from or consulted at the library of the Deutsche Gesellschaft für Dokumentation.

HARVARD, JOSEPH. Bilingual guide to business and professional correspondence (French–English). French text by Félix Rose. London, New York, Pergamon Press, 1969. 221 p. 25*s* paper (SBN 08 015594 4); 35*s* cloth (SBN 08 015973 7).

This is a reprint in revised format of the 1965 edition of this book. It provides a selection of sentences and phrases which would be found useful for composing business letters of various kinds. It deals not only with the layout and content of typical business letters, but also with such matters as travel arrangements and applications for employment. There are also lists of relevant English and French abbreviations, and differences between English and American vocabulary. The subject matter is given under different headings, with the English version on the left-hand page and the French on the right. There is no index, but there is a reasonably detailed contents list.

This book should be a useful guide for simple routine business correspondence between French- and English-speaking countries.

INTERNATIONAL INSTITUTE OF REFRIGERATION. Bibliographic guide to refrigeration 1965–1968/Guide bibliographique du froid. London, New York, Pergamon Press, 1969. 646 p. 250*s*; $33 (SBN 08 006557 0).

This book is the third Guide to Refrigeration published by the International Institute of Refrigeration. It consists of bibliographic references to all the documents abstracted in the International Institute of Refrigeration *Bulletin* 1965–8, and includes a list of books received by the Institute's library during this period. The references are classified according to subject; there is a comprehensive contents list as well as subject and author indexes. The subject index refers the user to a classification code number and is rather cumbersome; the author index refers directly to the page and number of the article or book involved. The references are all given twice: an English version on the left-hand side of the page and a French on the right, the source therefore being quoted twice; it is doubtful whether even article titles need to be presented in both languages. In spite of this unnecessary duplication of references and a few spelling mistakes and strange translations, the book should prove a useful guide to the literature of refrigeration.

LIBRARY ASSOCIATION (Reference, Special and Information Section. North Midlands Group). Union list of current commercial, scientific and technical periodicals in the North and East Midlands. 2nd edition. Edited by Audrey A. Butter and Geoffrey L. Hayhurst. London, 1969. 55 p. 45*s* (SBN 85365 110 8).

The first edition of this union list was published in 1960 since when the National Lending Library for Science and Technology has become fully operative. There is still a demand, however, for this type of union list giving holdings of journals in a particular area, for local inter-library borrowing.

This is an alphabetical list of the holdings in more than sixty public libraries and industrial organizations in the North and East Midlands and includes some titles which are difficult to locate. Holdings of superseded titles are given under the current title of the journal with reference from the earlier title.

SAFETY IN MINES RESEARCH ESTABLISHMENT. SMRA Bibliography. 3rd edition. Compiled by M. Belton. Sheffield, 1969. 325 p. 38*s*.

This bibliography is a listing of publications by SMRE staff since the organization was founded in 1908, up to the end of 1968. Reports published by the Research Establishment itself are included as well as papers published in journals and papers given at conferences and meetings.

The main section is a bibliography arranged alphabetically by author and then chronologically under each name. There is a numerical listing of papers and reports issued by SMRE and under its former name of Safety in Mines Research Board. For the first time the subject index of the bibliography has been computer generated: the index entries are based upon words used in the original title and supplemented where necessary.

THE FUTURE OF SCIENTIFIC AND TECHNOLOGICAL PUBLICATIONS

A. A. SMAILES

Iliffe Science and Technology Publications

Paper presented at an Aslib evening meeting, Wednesday, 26th November 1969

I AM sure you do not need reminding of the flood of scientific information that is available today and the estimates of its growth in the next two decades. In 1967, Olaf Helmer, then Senior Mathematician at the Rand Corporation, forecast that scientists and engineers would increase from five million, in 1967, to twenty-five million by the year 2000 and their total productivity would go up by a factor of ten. He declined to assess the associated growth of, and need for, scientific information but merely stated that there would be substantial changes in the way in which science would actually be transacted. It is these 'substantial changes' that concern the publisher, editor, information scientist and librarian, because if we do not anticipate—or at least keep pace with these changes—then we will not be able to meet the information needs of our readers and we will become redundant. Scientific information is a growing industry and it would be ironic if we could not survive amid an abundance of information. I regard the chance to do something about the flow of information as a response to opportunity, not as an act of desperation. The big problem is to sort out what is pertinent among this information and, in this world of rapid change, select and develop the technological devices that will match the needs of the scientist to this mass of information. As a first step, I suggest we should define an ideal information system so that our progress can be planned and measured against the best possible datum.

I suggest an ideal information system should be capable of doing much more than producing and accommodating documents. There is clear evidence that scientists spend as much as one-third of their working lives devoted to scientific communication, of which half is oral and half is written. Much of the written communication involves unpublished material. Indeed it is the familiar 'invisible college' at work and I foresee increasing activity in this sphere. An ideal communications system therefore has to cater for 'invisible colleges' by being able to provide an informed response based on all available intelligent and qualified opinion both published and unpublished. The system must have total recall, have read extensively, be capable of evaluating what has been read, be able to reorganize materials, to synthesize new ideas, be instantly available either in human or electronic form, and at all times be sensitive to the habits and needs of the individual.

Now all this is pretty demanding but if this definition of an ideal system* has any merit then it becomes possible to define some parameters which will guide our forward thinking and planning. I suggest these parameters are:

1. That relevance, accuracy and accessibility are, and will continue to be, the three fundamentals of any scientific information system.
2. Only quality information will be of any value to the scientist.
3. That the written and spoken word will not be significantly displaced by more flexible or more adaptable tools for human communication, certainly not in the next three decades and probably for much longer.
4. The written and spoken word will be adapted to new information systems.
5. That only information systems that, in the longer term will not require continuing subsidy will be acceptable. (And here I speak as a member of a commercial organization.)
6. The well-established divisions of primary and secondary information systems will, with slight modifications, continue for the next three decades.
7. The best way to research and develop information systems in depth will be to market them by stages, refining them as readership requirements are identified and the economic return to the publisher established, beginning with adaptive systems directly responsive to the needs of the user.

In setting out these parameters I have assumed the nature of the information available and the manner in which it will be generated will still require the publisher to apply the principles of relevance, accuracy and accessibility to it.

Let us first take relevance; I would suggest that relevance also implies quality and therefore the publisher must continue to examine and edit all the information available for quality. I also suggest that for at least the next three decades and longer there will be no substitute for the human being in this role and that the tasks of the knowledgeable, skilled and critical editor, backed by the collective expertise of an editorial board will continue to be essential and thus ensure relevance and quality irrespective of the method of processing and distributing the information. Included in this editorial expertise will, of course, be accuracy, the requirement for which will in no way be diminished by the more exacting standards of material available.

In the search for quality, I believe scientists will demand more selective primary information and higher quality secondary information put together in one information package. The next three decades will see scientific information focusing more and more on critical reviews-in-depth, edited by the most eminent authorities in the field and backed by accurately indexed and readable summaries of the relevant primary information. Please note that not all the primary information will be included in these indexes. Indeed it will be the task of the reviewer and the editor to eliminate everything that is neither relevant nor accurate, so that the reader, in one go, has all that he needs. This is in line with the Aslib view of key information journals.

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* For brevity when I refer to scientific publications or systems I mean scientific and technological systems.

Apart from the established disciplines there will also be, I believe, a steady but significant trend towards information needs in multi-disciplinary technologies. Since 1945 the tendency has been to develop technologies with overlapping disciplinary interests; some examples are cryogenics, solid-state sciences, and communications. The scope of the sciences has also increased and now one talks freely of environment, urbanology, pollution and many others, some of which are perhaps better classed as social sciences. These rapid developments are partly as a result of government and economic pressures seeking to supply new techniques more quickly to industry, partly because of the need to understand the many social phenomena of the recent decades but also because technology draws more and more on different sciences for its understanding of the problems that are encountered. Non-destructive testing for example, is a subject which evolved from radiography and ultrasonic testing. Although techniques in non-destructive testing are now becoming more simple and more automatic, interpretation is becoming increasingly demanding and requires greater knowledge of subjects such as fracture mechanics. As the technology develops so do the interest and information requirements of government, industry, the scientists and the technologist. With non-destructive testing there is now a cluster of firms selling radiographic films, x-ray tubes, ultrasonic sets, magnetic ink and all the other associated paraphernalia. A society has been formed and a trade association may soon be established. Thus from nothing there has developed within fifteen years a virile multi-disciplinary technology with its own information needs. I believe many other inter-disciplinary technologies will develop in a similar manner and new information systems will be required to meet their needs. This I see as a continuing and expanding process. Not that the established disciplines will remain static, but there is certain to be a continuous flow of new material not wholly relevant to the present framework of publications.

To turn to accessibility. Here one must polish a very cloudy crystal ball and plunge into the glaring world of technological change. If one area stands out above all others in the effect it will have on our lives in the next ten to twenty years it is communications in general and information processing in particular. Even today, live television from the moon is regarded as commonplace, yet who would have bet—as some far-seeing person did earlier this decade—that man would take his first steps on the moon this year, let alone televise himself doing it. In terms of money spent, people affected and changes in the way we do things, developments in communications and information processing will have few equals. You are, I am sure, all familiar with the present position of indexing, current awareness, microfilm, SDI, and the INSPEC project, so I will leave these immediate developments and cast my net a bit wider and deal with trends in technology. My summary of these trends appears to indicate:

1. A hundred-fold decrease in access time to small computer memory banks.
2. Increases in computer memory capacities which will be capable of meeting the largest storage needs.
3. Reduction in computer costs with the development of integrated micro-electronic circuits.
4. Less use of high speed mechanical printers and much more use of electrostatic devices and visual displays which do not require printing.

5. Technical improvements in information transmission bringing wider use of facsimile even closer.
6. Rapid progress in optical character reading.

If these and other related technologies continue to develop, it is feasible that in a few (highly subsidized) areas a scientific publisher will, perhaps by the middle 1980s:

1. Type rough copy directly into a computer.
2. Edit the material on some kind of visual display.
3. Add appropriate illustrations.
4. Distribute the completed text by electrical impulse to the scientist, either directly, or by using an information specialist as a filter.
5. Allow the scientist to read the text at leisure either by electrostatically printing a hard copy or projecting it on a screen with a visual display device.
6. Build in a suitable on-line storage and individual retrieval mechanism to the system.

All this is very exciting and for some of you the middle 1980s may be too conservative a forecast. But I have been reminded recently of what has been called 'the clipper effect'. Clipper ships proved viable and economical long after the introduction of steam propulsion because the clippers had been brought to a very high state of efficiency and could compete successfully despite the almost overwhelming technological superiority of their competitors. I believe the same effect will be experienced in scientific publishing and the existing product, a printed journal, will continue to be dominant and remain in much the same format in 1980 and probably up to 1985. This will apply particularly to the nations with less capital resources whose requirement for sophisticated information systems will develop much later than in say America or Australia. But time is not on the side of the publisher and we shall not be afforded the comparatively leisurely demise of the clippers, if we do not plan for change now and control and guide developments, rather than let them control us.

But the energy and capital to create the conditions for change are never easy to find. There are so many outside influences such as the development of the economy of the country, the rate of investment possible, the progress of other nations, identifying and reaching markets, all of which can present obstacles that can readily be used as excuses not to do anything. But above all the substantial human problems involved will be the most difficult to overcome. Information is a highly personal product and too rapid a change involves physiological and often psychological problems that are not easily absorbed. And here, may I digress and suggest that, just as with human editors, I foresee the continuing need for information scientists and librarians to process information for the scientist in the long-term future. Although sophisticated information systems will automatically provide readership feedback to the publisher, the information scientist will continue to play a valuable role as a go-between, particularly in identifying and providing for the fringe stimulus reading so essential to the scientist.

On costs and economics, I believe the process of economies of scale must continue and I envisage learned institutions, societies, libraries, governments and commercial companies joining forces to provide national information systems and eventually international systems. But costs to the individual reader for full SDI will be expensive and the prime sales outlets for sophisticated systems will be to nominated individuals or departments in larger establishments.

And now, having briefly galloped through my general ideas, I must take the plunge and offer specific suggestions and timings for the future. Assuming there are no fundamental or cataclysmic changes in world developments, I envisage the next significant steps in accessibility and presentation of scientific information to be:

1. By 1975 there will be selective on-line document storage and retrieval facilities available on a commercial basis; but at a cost.
2. These facilities will be developed to employ natural language by 1980 and between 1980 and 1990 automatic translation of material will be added.
3. Optical character recognition devices capable of reading and storing information will be developed by 1980 and the extensive use of SDI services will be commercially available also by 1980.
4. Copyright agreements will be streamlined with authors and publishers agreeing royalties for each document stored, scanned and retrieved.
5. Between 1980 and 1990 electromagnetic circulation of local printing of newspapers and periodicals to be a commonplace but whether this type of presentation can be used economically for the specific information required by scientists is open to question.
6. By 1990 national bibliographic data and information banks for major disciplines will be developed and these will later merge into international banks.
7. Finally, towards the 21st century will come on-line interrogation systems in natural language enabling the computer to act conversationally.

If even half these forecasts are valid we may thus see ourselves nearer the ideal information system at the turn of the century. But whatever the developments and despite these enormous leaps forward that are staggering to contemplate, I still cannot see the relegation of the human being to the role of a cypher in information processing for a long time to come. I believe that the greater the volume of material, the more complex the system, the corresponding greater depth of understanding and interpretation required by publisher, editor, librarian and information scientist. If I am right, then there is a job for both you and me in the future, a job which will be as exciting and rewarding as any that I can envisage.

DISCUSSION

A. K. PARKER (Cambridge University Press) made the point that a great deal of scientific literature comprised value judgements rather than basic data, which later could be put on computer banks fairly easily. It was the value judgements which were so important to librarians, information scientists and the research worker; MR PARKER asked how the computer would deal with them. MR SMAILES said that there would be a need to control the quality of the input. This would be done by skilled editing plus the direction and advice of a board made up of the most knowledgeable individuals in the field. There would also be series of critical 'state of the art' reviews by the same individuals.

MR J. H. PETRIE (Postgraduate School of Librarianship and Information Science, University of Sheffield) suggested that scientists need more incentive to write critical reviews in order that scientific work may be assessed. Scientists were more interested in the rewards of basic research and these were rarely monetary. MR SMAILES said that scientists were more likely to get rewards in terms of recognition than of pay. This was the kind of project which could be accomplished during a sabbatical. In the United States they had a more realistic approach to authors in terms of payment and time available for publishing reviews than in Europe.

MR S. FRANCIS (School of Librarianship, North-Western Polytechnic) asked the views of the speaker on the future of 'page charges', Information Exchange Groups and Copyright. MR SMAILES said that he thought page charges were not good policy and would not be a part of his company's financial policy. The Information Exchange Group played a valuable, indeed essential, role. Any publisher would be pleased to be able to draw on the information so exchanged. He hoped copyright difficulties would be solved by an agreement between authors, publishers and users, similar to the present arrangements for sound and visual reproduction.

DR L. COHEN (The Institute of Physics and the Physical Society) said that there was no doubt that the American Institute of Physics felt that page charges were essential for their journals and this despite the recent difficulties which shortage of NSF funds have caused. He would, however, like to raise the question of who was going to pay for the new developments in information retrieval described by MR SMAILES, for example, computer terminals in every office and laboratory. The SRC at the moment did not seem to be taking this into account. The capital sums as well as the running costs would seem to be considerable. MR SMAILES said that he hoped that with the assistance of development work undertaken with OSTI, investment by private companies and institutions costs would eventually come down. DR COHEN said it was the user cost with which he was at the moment concerned, not the publisher's costs; in particular costs during the next ten years before the new systems were fully viable. MR SMAILES thought some subsidy for an interim period would be necessary.

MR P. K. MINTON (W. Greenman and Company) asked how publishers would ensure that information got to the right people (i.e. what forms of dissemination would be used) and that value judgements would not reduce information flow by narrow selectivity. MR SMAILES said that the main safeguard in this connection would be the critical reviews by experts to which he had already referred. Quality input produced quality output.

MR C. J. EVE (Brixton School of Building) asked MR SMAILES to indicate what he meant by 'quality of information'. He had used the word in a variety of contexts with a variety of meanings. He also asked if MR SMAILES had any plans for elimination of excessive delays in the publication of learned papers and how he envisaged that problems of security—both commercial and national—would be overcome during the trend to 'national and international information services' that he had discussed. MR SMAILES said that his definition of 'quality' in this context was a combination of accuracy, relevance and accessibility. The system of refereeing was essential to preserving quality, but it did introduce an element of delay; the greater flexibility given by the computer would help to overcome this.

MR GRAHAM LEA (Lea Associates Limited) asked the speaker whether, as a commercial publisher, he was concerned at the nationalization of information in the UK, especially in view of the recommendations in the SATCOM report recently published by the National Academy of Sciences which appeared to favour commercial publishers. MR SMAILES said he was in favour of the private enterprise, backed, where appropriate, by Government investment where national interests were involved.

K. R. GREENHALGH (Atomic Energy Research Establishment) asked if the use of computer setting of journals would increase If so, would it be feasible to scan automatically the computer input for titles and recurring significant words in the text, to create a computer-held data bank, or to produce printed indexes. MR SMAILES replied that he understood this was technologically possible; he hoped it would become commercially feasible.

DR D. J. CAMPBELL (Independent) said that the meeting had been a most interesting and useful one. He was (probably) one of the very few members of the audience who had worked in a periodical publishing house; this was about ten years before. Consequently he knew something of the other side's problems. In those days there was no association or meeting place for editors of technical periodicals. His own firm's editors were not even supposed to be on speaking terms with editors of competing journals! They were, of course, but *sub rosa*. If this lack had now been filled he felt it would be invaluable for such a body to have joint meetings with Aslib. In the meantime, as such meetings were rare, he felt it would be undesirable if the speakers, as representatives of the technical press, went away unaware of the powerful feeling of many Aslib members about some of the practices of that press. Most of these 'bones' were of long standing, and had been wittily 'picked' in a paper by Mr Agard Evans called 'If I had my way—with publishers' in *Aslib Proceedings* for January 1953. As one instance, he quoted the 'indispensable latest work' on some subject, only available if you took out a new subscription to some periodical; the fact that you already had five made no difference! These works too often proved to be rehashes or even reprints of old articles. He knew of no other trade which treated old customers in this cavalier fashion. Then there were newer 'bones' such as 'controlled circulation'. The absurdity of somebody in London deciding that only Messrs X, Y and Z in an organization of which he knew little could have a periodical was obvious, particularly when two proved to be retired and the third dead!

Later DR CAMPBELL begged periodical publishers not to computerize their circulation systems until they really knew how to do it. He had had several cases where repeated complaints of non-delivery or mis-delivery (wrong numbers of issues, addresses, etc.) usually completely ignored, had been followed up by a letter to the Managing Director, and an embarrassed reply to the effect that they had computerized their circulation some months before, and nothing had gone right since. MR SMAILES said his company did not publish controlled circulation journals, but he was sure that these journals had a definite role to play in publishing. His firm had not yet put their subscriptions on a computer but would certainly do so once the specification for the computer program had been tested and proved.

MR D. E. H. REEDER (BISRA—The Inter-Group Laboratories of the British Steel Corporation) said that the present trend in the costs of information systems meant that they were becoming available to fewer and fewer people and if the ideas put forward by MR SMAILES came about they would be so costly as to be only available to some Government Departments and a few very large commercial organizations; and even for these they would only be available to very select departments or members of staff, especially if there was a need to have on-line television receivers or computer printout facilities. What did MR SMAILES think was going to be the means by which the bulk of the workers especially in the smaller and one-man firms would be able to get the information they need? MR SMAILES said that traditional publishing and information dissemination would continue alongside the new systems and publishers would have to continue to meet the information needs of large and small customers alike. He appreciated that sophisticated information systems would be expensive but their value in cost/effectiveness terms would be cheap.

COVER-TO-COVER TRANSLATIONS OF SOVIET SCIENTIFIC JOURNALS

A. TYBULEWICZ

Editor, Soviet Physics-Semiconductors

Paper presented at a meeting of the Aslib Technical Translation Group,
17th October 1969

ALTHOUGH I am going to deal generally with the published translations of Soviet scientific journals, some of what I have to say necessarily stems from, and is influenced by, my own experience as a full-time editor specializing in certain Russian physics journals. I know you will forgive this bias because most of the problems associated with the translation of physics journals are common to all other specialist scientific journals.

Before we consider the history, present state and mechanics of cover-to-cover translations, we must ask the following basic questions:

1. is Russian scientific literature sufficiently important?
2. if it is, must it be translated?
3. what is the case for concentrating the translation effort on Russian work at the expense of German, French, Chinese or Japanese?
4. why should translations be made in the form of cover-to-cover journals?

1. The answer to the first question has been given, in the case of physics, by a survey supported financially by the National Science Foundation and carried out (on behalf of the American Institute of Physics) by D. E. Gray and E. Hutchisson.[1] The advice of American physicists to Gray and Hutchisson was that the Russian material is unquestionably important and cannot be ignored. It is much to the credit of the American physicists that they recognized the importance of Russian scientific effort and started their translation programme in 1955, before the need became obvious to everyone after the launching of the first Sputnik in 1957. (In fact, the need for the translation of Soviet work was recognized much earlier by Consultants Bureau of New York, who started their first cover-to-cover journal in 1949, as will be discussed later.)

According to R. E. O'Dette,[2] knowledge of much of the Russian scientific effort is essential to the work of scientists outside the Soviet Union. The penalty of ignoring Soviet work can be heavy, and ample evidence exists to support this contention. An early example is that cited by W. Locke,[3] concerning the delayed discovery of a Russian paper on the application of Boolean matrix algebra to the analysis and synthesis of relay contact networks, which appeared in an important and readily available Soviet journal. Locke estimates that the cost to the USA of the late discovery of this key contribution to information theory was $250,000.

We must not forget that even when high-quality translations are readily available, the information can still be lost if they are not read. Paul Kiefer of

Plenum Publishing Corporation cites the following example. In January 1962, the National Aeronautics and Space Administration announced that Explorer XII, a satellite launched in August 1961, had discovered a new radiation belt with an 'unexpected boundary' at 40,000 miles from the earth. In fact, the same belt was discovered by Soviet rockets in 1959 and this was reported in translations of *Soviet Physics—Doklady* in 1960 and *Soviet Astronomy—AJ* in 1961. The two journals were translated by Plenum for the American Institute of Physics.

Quantitative estimates of the languages used in the journal literature of science in general and of physics in particular are discussed in my paper on the language problem in physics.[4] According to these estimates, the incidence of the Russian language is second to that of English in physics, chemistry, biology and mathematics; 17, 23, 10, and 21 per cent respectively, of the total number of journal papers published in these subjects, are in Russian. The numbers of papers published in Russian in each of the four subjects are considerably higher than the corresponding numbers of German and French papers combined. The situation is different in engineering, where publication in the Russian language is third to English and German, and in medicine, where it is fourth to English, German, and French.

2. The answer to the second question—must Russian literature be translated—is self-evident. The number of Russian-reading scientists is estimated as ranging from 1 to 5 per cent of the total community of Western scientists. The figures for engineers and doctors are likely to be much lower.

3. The third question is also easily answered. The translation effort is concentrated on Russian rather than on German or French, or both, because much less is published in these languages than in Russian, and Anglo-Saxon scientists and engineers have a greater fluency in German and French than in Russian. The quantitative argument applies also to Chinese and Japanese: much less is published in these languages than in Russian and much of the Japanese scientific effort, particularly the major research projects, is reported directly in English. However, the linguistic argument relating to the scarcity of scientists and engineers fluent in Chinese and Japanese is stronger than that in the case of Russian. It is for this reason that, for example, the American Institute of Physics has recently started a Chinese cover-to-cover translation programme. Moreover, the demand for access to Chinese literature will grow when China has established herself as a front-rank technological nation. Unfortunately, the American effort has been thwarted because the major Chinese scientific journals have ceased to appear since the 'cultural revolution'.

4. The final question is concerned with the problem of 'custom' translations of individual papers to meet the needs of particular firms or individuals as against the 'mass production' approach of translating major Russian journals from cover to cover. A clear answer to this question is given in a National Science Foundation survey, released in 1959, entitled *Providing US Scientists with Soviet Scientific Information.* The survey concludes: 'To provide full translations in broad subject fields has been found preferable, to guard against inadvertent omissions and to facilitate bibliographic handling. An economic study of this approach has been made, and the results show that even if only one paper in forty is of general interest, it is cheaper to translate all forty of them than to

determine which one to translate.' This is also in accord with the findings of Gray and Hutchisson: that complete journals should be translated because no group of scientists is competent to decide what is important to the whole area of scientific activity, and because what seems insignificant now may be the key to major achievements in the future.

O'Dette[2] points out many other advantages to the cover-to-cover philosophy, apart from the arguments just given. Completely translated journals can be treated in the normal way of abstracting, indexing and reviewing services; they are easy to reference and store; in short, they have all the advantages of any other journal.

Finally, the rising sales of the cover-to-cover translation journals provide a convincing proof of the need they satisfy.

History and present state of journal translation publishing

In 1949, E. M. Coleman, founder of Consultants Bureau (now a division of Plenum Publishing Corporation), started the first cover-to-cover translation of a Soviet journal, *Zhurnal Obshchei Khimii,* which was and is still called *Journal of General Chemistry of the USSR*. In the twenty years since that first journal, Mr Coleman's Plenum Publishing Corporation has become the largest publisher of cover-to-cover translations anywhere in the world. Currently, the Corporation is translating 72 Russian journals, representing 75,000 pages of text per annum. Of these 72 translations, 62 are published by Plenum on its own account, and 10 are translated and typeset for the American Institute of Physics (8 journals), the American Mathematical Society (1 journal) and the American Society of Civil Engineers (1 journal).

Examination of several lists[5, 6] (which may not be comprehensive) shows that the following firms are currently active in commercial publishing of cover-to-cover translations from Russian into English (other languages are expressly excluded):

Publisher	*Journals*
Plenum Publishing Corporation, New York	62
Faraday Press, New York	28
Scientific Information Consultants, London	9
Pergamon Press, Oxford	7
Scripta Technica, Inc., Washington	5
others (one each)	10
TOTAL	121

All these journals are published, to my knowledge, without subsidy and the firms concerned have taken normal commercial risks in starting new journals.

The leading non-commercial publisher is the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia, with thirty journals under its wing.

I am personally most familiar with the activities of the American Institute of Physics which is the largest publisher among the scientific learned societies with fourteen cover-to-cover translations from Russian. Of these, eight are prepared for press by the Plenum Publishing Corporation, four are translated directly for the Institute under the editorship of J. G. Adashko, one is handled by the Optical Society of America and one is subcontracted to Scripta Technica Inc. The American Institute of Physics started in 1955 with *Zhurnal Eksperimentalnoi i Teoreticheskoi Fiziki* (*Soviet Physics—JETP*) with a subsidy from the National Science Foundation. Currently, the translation programme of the American Institute of Physics is completely self-supporting and provides funds for launching new translation journals.

The following table summarizes the current activities of non-commercial publishers.

Publisher	*Journals*
Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia	30
American Institute of Physics, New York	14
American Geophysical Union, Washington	8
Institute of Electrical and Electronic Engineers, New York	6
American Geological Institute, Washington	4
American Mathematical Society, Providence, R.I.	4
Chemical Society, London	3
National Lending Library, Boston Spa, Yorks	2
Production Engineering Research Association, Melton Mowbray	2
American Meteorological Society, Boston	2
British Welding Research Association, Cambridge	2
others (one each)	10
TOTAL	87

The non-commercial publishers include government departments, learned societies and research associations (in the UK only). They are to be congratulated for providing a service to science and technology as well as for their good business sense. After the initial subsidized period, these publishers are finding that most of the translation journals are self-supporting or profit-making.

According to my probably incomplete analysis, the total number of cover-to-cover translation journals is 208. They are now a big business with a yearly turnover which I estimate at between seven and ten million dollars or three to four million pounds.

It is worth pointing out the dominant position of the USA in this field. 172 out of a total of 208, i.e. about 83 per cent of the translation journals are published in the United States. Only thirty-five are published in the UK and one in Canada.

Mechanics of the preparation of a translation journal

I am indebted to Paul Kiefer, Editor of Plenum Publishing Corporation, for the following account of the procedure followed in the translation and production of a cover-to-cover translation journal:

(a) Issues of the Russian original arrive by air mail from the Soviet Union and translators are invited to select items they wish to translate from copies of the table of contents;

(b) the selections of articles made by the translators guide the Plenum Editor in distributing the papers among the translators in accordance with their special knowledge, ability, average output and commitments to other journals translated by Plenum;

(c) six weeks after the distribution of the original papers, the manuscripts are returned by the translators; they are then edited for style and any omissions or queries are referred back to the translator;

(d) in the case of journals translated for the learned societies, such as the American Institute of Physics, the translations are submitted for scientific review to editors appointed by the society; these editors have the power to amend, query or reject completely any of the submitted material;

(e) the translations are then typeset on proportional-spacing typewriters and figures and tables, displayed equations, etc., are photocopied and pasted in;

(f) the translation journal is usually published six months after the nominal date of appearance of the original.

Scientific and linguistic requirements for satisfactory translation

It is my firm belief that a satisfactory scientific or technical translation can be made only by persons who are scientifically or technically qualified, preferably to degree level, and who are fluent in the two languages concerned. Moreover, it is better for the person translating into, say, English, if he has received his scientific or technical education in an English-speaking country. The qualification must be supported by current knowledge of, or at least an interest in, the subjects on which the translator is working. A paper qualification in pre-1939 physics is of little use in tackling work on lasers, computers or the space sciences.

Even when all the foregoing requirements are met, it takes at least a few months and possibly a year or longer to reach a satisfactory level of proficiency in a given subject, particularly in one which is rapidly developing and whose terminology is evolving. The kindly guidance of a more experienced colleague or editor is probably the best method of learning the techniques.

It does not follow, however, that everyone who is well-qualified scientifically and linguistically can translate well. A good scientist whose English and Russian were good, failed to produce an acceptable translation after two years of coaching.

The rigorous editing of manuscripts is an essential step in the preparation of a well-produced journal. Even a manuscript submitted by the best translator needs editing. The editor must of course satisfy all the requirements of a good translator and should have extensive experience in translation and in the subject concerned. The editor must have a circle of high-calibre advisers on scientific and linguistic matters. For example, there should be no hesitation in obtaining scientific advice from leading research workers in a subject when one is faced with an abstruse paper on that subject and difficulties in terminology, methodology, etc., are encountered. Often the help of a university professor or his equivalent in industrial or government research must be sought. This advice applies equally to the conscientious translator.

References cited in Russian papers commonly have many errors, particularly in citations of non-Soviet work. These have to be checked and corrected, which is a time-consuming and tedious task.

Linguistic problems

I shall now illustrate the linguistic difficulties regularly encountered, by a few examples drawn from the translations of Russian solid-state journals.

The Russians use 'zona' to mean both 'band' as in the term energy band and 'zone' as in the Brillouin zone. Quite frequently, the word 'zona' is found unqualified by an adjective in a context where it can be interpreted as either an energy band or a Brillouin zone. It may require perhaps an hour or two of searching in the references cited, or in other physics literature, just to establish the correct meaning of 'zona' in this particular context. The same difficulty is, of course, encountered by the Russian physicist reading the original in his own language. The difficulty is simply due to careless writing and editing.

A similar case is provided by 'provodnost' and 'provodimost' both of which are used for 'conductivity', 'conduction' as well as 'conductance'. Physically of course, the three meanings are quite distinct and care is needed to find the right meaning in given circumstances.

Another word with two meanings is 'élektronnyi'. It can be '*n*-type' and 'electron' or 'electronic' in semiconductor science. Both meanings can and do occur within one paragraph or even in the same sentence, e.g. *electronic* thermal conductivity of *n-type* semiconductors.

A different difficulty is typified by 'kombinatsionnoe rasseyaniye' for 'Raman scattering' which is a deliberate attempt to show that Russians do not recognize Raman's priority in this matter.

There are many words in Russian for which there is no counterpart in English and vice versa. A famous example is 'avtomodel'nyi', nowadays generally rendered as 'self-similar'. Before this rendering was generally accepted there was much confusion because of the many variants used in translations.

These examples indicate that a good translator must go well beyond what he finds in Callaham, Emin or that valuable idiomatic guide by M. G. Zimmerman, called *Russian-English Scientific and Technical Dictionary of Useful Combinations and Expressions* published by Mir, Moscow, and distributed by Plenum Press, New York (1967).

There are some of course who try scientific translation with Smirnitskii's dictionary like a beginner abstractor for *Physics Abstracts* who rendered 'zapornyi elektronno-dyrochnyi perekhod' as 'blocked electron-hole transition' instead of 'barrier p-n junction' and then defended himself jokingly by saying that the alternative given by Smirnitskii was 'constipated passage'.

Documentation problems

Some cover-to-cover translations have volume numbers and even issue numbers (e.g. *Uspekhi Fizicheskikh Nauk* translated as *Soviet Physics—Uspekhi*) different from those of the originals. When this is added to the usual custom of dating the translation six months after the appearance of the original, the relationship between the primary paper and the translated article becomes difficult to establish.

Different transliteration systems are still being used, but the Royal Society

'British' system is winning. There are also some 'systems' based on no authority whatever. Although the various systems are identical in many respects, considerable confusion is nevertheless caused because the different systems can produce different English versions of the same Russian word. This is particularly exasperating when the variations are encountered in the transliteration of a surname, particularly the initial letter. First, it leads to anomalies in indexing; and secondly, one may fail to recognize a name of an eminent Western or Oriental scientist which has been transliterated from the Russian rendering. Many well-known named effects have been transliterated to give new absurd names—and have temporarily baffled everyone.

There are also difficulties due to different translations of such Russian journal names as *Doklady*, *Trudy*, *Izvestiya*, *Uspekhi*, *Voprosy*, *Sbornik*, etc. The solution here is to cite always the Russian original title in transliterated form, in addition to the name of the cover-to-cover translation.

The future

What about the future? I am not optimistic about machine translation taking over fully from human translators in the foreseeable future. Let me quote from John Davy's article in *The Observer* of 10th August 1969, p. 21: 'Current opinion is that the problem [of translating one language into another] is no nearer solution than it was when work started and that it would never have been tried if the real nature of the problem had been understood.' Davy refers to millions of dollars spent wastefully in the USA in the search for the solution to the problem.

It may be that some future generation of computers will be able to take the tedium out of translation by providing the first crude draft. However, there will always be scope for well-qualified translators in the post-editing or pre-editing which will be required even when the most sophisticated machines are used. This is simply due to the fact that the human brain is much more flexible than the most advanced computer conceivable at present.

I would personally welcome a much more practical translation aid in the form of computer-stored vocabularies as proposed by Dr J. B. Sykes in his lecture to the Aslib Technical Translation Group.[7]

There is, of course, a simple and final solution to the language problem in science and technology. A day may come when all that is important is published in English, as is the case now in Japanese scientific effort. Perhaps that is why the commercial publishers of translations have shifted or are shifting their interests to publishing of English originals. I shall stop now with this 'awful' possibility for your contemplation and comment.

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DISCUSSION

MR ROBERTS (Unilever), and others, pointed out that non-physics journal translations were characterized by time lags, compared with the original, of up to one year or more.

MR STOKER (free-lance translator) had experience of cover-to-cover translation as early as 1938. He commented on the highly variable quality of original Russian journal editing and proof-reading.

MR MALEWSKI (free-lance chemical translator) admitted that Soviet chemical journals, while generally devoid of padding, had editorial deficiencies.

MR HAMMOND (ICI Plastics) commented on the apparent worthlessness of certain types of Russian texts. His experiences were echoed by MR MOSELEY (Rubber and Plastics Research Association), who suggested that technologists found useful information in only about an eighth of collections, such as *Referativnyi Zhurnal*. In company with DR STUBBS, he found the volume of Russian literature out of all proportion to its importance. DR STUBBS stated that in his work on behalf of Consultants Bureau, which has included visits to the USSR Academy of Sciences, he vetted specimen translations submitted by those interested in doing cover-to-cover translation work. At one stage he was rejecting 75 per cent of the applications reaching him.

MR MANSFIELD (ERA) asked about the marketing techniques employed on launching new cover-to-cover translations, and MRS SILCOCK (free-lance translator) queried what other countries were doing in this connection. MR TYBULEWICZ and the CHAIRMAN replied that marketing was by trial and (occasional) error, and that there were very few non-English cover-to-cover translations of Soviet scientific journals.

In reply to MR RONSON (Culham Laboratory, UKAEA) established MR TYBULEWICZ estimated that several thousand translators are engaged in journal translation work, and MR RONSON contested the thesis that authors have to be as it were 'interpreted' by the translator and questioned the suggestion that, of the alternative words available to an author, often he quite arbitrarily selects the one which 'catches his fancy'.

MR TYBULEWICZ assured MR NEWMAN (Courtaulds, Coventry) that a degree and/or equivalent experience was essential in a journal translator, the job becoming progressively harder, the further one progresses from engineering and general science. He justified the high costs of translations on the basis of their importance, and considered that the commercial risk was not unreasonable, each journal surviving or going to the wall on its merits. Sales of successful journals, including on the continent, where English is used as a last resort for Russian, can total many hundreds. Cover-to-cover publishers, and their advisers, are very loath to condemn a journal as worthless to everybody because such judgement would be subjective.

On the subject of copyright, MR TYBULEWICZ understood that certain fees were in fact paid to Russian publishers by their Western equivalents, although there was no legal obligation to do so.

LIBRARY SERVICES FOR OPEN UNIVERSITY STAFF AND STUDENTS

D. J. SIMPSON

Librarian and Director of Media Resources, Open University

Paper presented at an Aslib evening meeting, Thursday, 11th December 1969

AS the Open University courses for 1971 are only partly written and many decisions have still to be made, a good part of any discussion on the Open University must inevitably be conjecture. Accordingly a *précis only* of this paper is given here.[1]

The Open University Library

Its chief function is to serve the Academic staff at Headquarters. There are about fifty of these and they will increase to around three hundred, including research assistants, in three years' time. The Library will provide the usual University Library services, plus some that are more common in special libraries.

There is the usual acquisition of books and periodicals at the request of the Academic Staff. The Library remit limits this to material intended to assist in the compiling of the courses. Private research is not supported as funds are limited. In 1968–9 a fund of £32,500 was available for the purchase of books, periodicals and other media. This consisted of a non-recurrent grant of £15,000 and a recurrent grant of £17,500. A quarter of this was for general material, such as bibliographical tools. The rest was shared among the Faculties and a few other departments. We buy BNB cards wherever possible and classify other material by BNB Decimal.

The Library liaises informally with other libraries. We approach libraries which academic staff wish to use, and discuss with other libraries their possible future relationship with Open University students.

We are also laying the foundations of future services, which we hope to provide as more library staff are recruited (at present there are six of us). We hope to recruit subject specialists who will provide a current awareness service and undertake searches in the literature and media of various subjects as required. We wish to provide active, rather than passive, services, after the manner of special libraries. Initially, the specialists will be research assistants attached to the Faculties, but it is hoped that the library establishment will eventually be enlarged to allow all such people to be members of the Library staff.

I am fortunate in having as an Assistant Librarian a previous member of the staff of Vis-News, a film library. She has a good knowledge of media sources and methods, and is at present working her way around the libraries and media centres of London and the Home Counties discovering who has what, available on which terms.

Some of our chief sources will obviously be the BBC Libraries, whose Librarians are very friendly and co-operative. One of our snags is the distance between Open University in Belgrave Square, where Media Production is located, Walton, where the Faculties are, and Alexandra Palace, where the BBC people engaged in Open University work are. We all have to keep in touch to avoid duplicated work—and duplicated approaches to outside sources for material. We are busy collecting catalogues of media at present. If anyone has lists of material he would like us to see we shall be very grateful to receive them.

We hope to use MARC eventually, and to make our subject catalogues in all media compatible, so that they may be integrated to allow mechanized multi-media searches.

We shall not jump hastily into the use of Data Processing. Current records are being prepared with an eye to conversion so that we may mechanize later, when we have enough staff to do the job properly.

The Library will make a special effort to collect material on Education Technology and it is hoped that, in later years, we may be of service in this field to other libraries.

As you know, media present very complex copyright problems, and a Publishing Manager shortly to be appointed will have this as part of his remit. In addition to acquiring media produced by other people, Open University will produce much on its own. Both kinds will be used in courses for Open University students and also for sale to other people and bodies at home and abroad. These purchasers may wish to make public use of the materials. You will see that very careful copyright agreements must be made if all parties concerned (authors, composers, artists, photographers, makers of recordings, films and tapes, and performers who read from a text or improvise) are to be fairly treated within the law.

The Library will have to be aware of the problems and careful not to offend against the law, or agreements entered into by Open University and others.

Some points which may assist in estimating the effect of Open University courses upon Public Libraries in 1971

In 1971 four Foundation Courses will be available.

1. Humanities
2. Mathematics
3. Science
4. Understanding Society

These will be repeated in 1972 and in 1973, with only minor amendments. They will be based on:

- (a) Correspondence courses
- (b) Radio and television broadcasts
- (c) Study centres, in towns of 80,000 to 100,000 population, or more
- (d) Weekend courses
- (e) Summer schools based in Universities during vacation

There will be about 20,000 students in 1971, taking one or two foundation courses. Each course will be taken by about 8,000 students.

Each course will take about ten hours per week of a student's time, so time for extra reading may be limited.

Booklists for the courses will be in two parts: (a) Set Books; (b) Recommended Books. Students will be advised to buy the Set Books, but as both Set and Recommended Books may be mentioned on the BBC programmes, a demand from 'eavesdroppers' on these programmes may arise.

Experience with previous BBC educational programmes linked to correspondence courses has shown that for every student successfully completing the correspondence course, ten people buy the course literature and one hundred watch at least some of the TV programmes.

Students will be advised to approach Public Libraries, and other local sources, for the Recommended Books, many of which will be standard books already in stock in most Public Libraries, but demand will tend to peak because the course notes will refer students to the books for any particular week of a course all at the same time. The courses cannot be staggered because of the radio and television element. Alternative titles will be named where possible, in order to spread the demand.

Lists are being published as soon as possible in the *Bookseller*, the *LAR* and the *Publisher*. It is hoped to issue them early in 1970 (some of these may have already appeared), but as the courses will not be completely written by then, the titles of a few recommended books may have to be announced in mid-1970.

The number of titles involved is approximately known:

The Humanities course will have fourteen Set Books, and about 150 Recommended Books, for alternative subjects, i.e. the student will be expected to take further only a selection of the subjects in the course.

The Mathematics course will have no Set Books and will be a self-contained course. It will have about 72–108 Recommended Books, including alternatives in the ratio of three to one, for students wishing to take any particular aspect further.

The Science course will have four to eight Set Books and about forty Recommended Books, including alternatives in the ratio of about four to one. Students will need to see the Recommended Books. They form part of this course and are not merely for further interest.

The Understanding Society course will have fifteen to twenty Set Books and about one hundred Recommended Books, for students wishing to take any subject further. The ratio of alternatives will possibly be about four to one.

Only the four Foundation Courses will be offered in 1971. In 1972, in addition to the four Foundation Courses, twelve other courses will be offered as well. In 1973 a further sixteen courses will be offered.

Distribution of Open University students in 1971 will be as follows: 20,000 students out of a population of c. 52.5m. This means about one in 2,500 or, in other terms, an authority serving 250,000 people will have about one hundred Open University students in its area.

Some Public Librarians have said that they will consider offering the following services:

1. Extra loan copies of Open University Recommended Books
2. Reference collections of Recommended Books

3. Deposit collections of Recommended Books in Open University Study Centres and Viewing Centres. These Centres will be located in towns of 80–10,000 population and over.

NOTES

[1] The history of the Open University is given in *The Open University. Report of the Planning Committee to the Secretary of State for Education and Science*. HMSO, 1969. SBN 11 270011 X, and, more briefly, in DES reports on Education June 1969 Number 56. *The Open University.* Current activities are detailed in the *Open University Prospectus*, obtainable on application to: Chris Batten, MA, Admissions, The Open University, P.O. Box 48, Bletchley, Bucks.

DISCUSSION

MR E. A. L. STUART-JONES (University of London Institute of Education) said that he thought that Mr Simpson's estimate of 60 per cent of students taking two courses was rather high in view of the large amount of time (ten hours per week per course) needed for study. He thought that most students would only have time for one course at a time. MR SIMPSON replied that the estimate of 60 per cent of students undertaking two courses was arrived at after a survey had been carried out amongst about 3,600 people.

MRS J. S. RODRIGUEZ (North West Kent College of Technology) asked at what times of the day TV and radio programmes would be broadcast. She also asked whether videotapes would be supplied. MR SIMPSON replied that these programmes would be broadcast during early evenings and on Saturday and Sunday mornings, as is the case with educational programmes at present. He said that recordings on videotapes would be expensive but these will be supplied to centres not covered by BBC2 transmissions, such as in parts of Scotland. In future, when more money is available, all mass media transmissions will be duplicated and sent to the regional centres.

MR R. J. HUSE (London Borough of Barnet) said that Local Authorities were now preparing their revenue estimates for the financial year 1970/71 and were already under instructions from the Central Government to limit growth to a ceiling of 3½ per cent. He asked whether the Department of Education or the Open University would be making a formal approach to Library Authorities for their support in the provision of recommended books? So far the only reference to the Open University had been a brief comment in Circular No. 57 that it would present 'a new challenge to the public library service'. While many libraries did not expect immediate financial assistance from the Department they could not present reports to their authorities until an official statement was received together with estimates of likely demand. MR SIMPSON replied that the information he had given in his paper was literally all that he could offer about the Open University at present. The Department of Education and Science, however, had asked MR SIMPSON to meet a small number of librarians to discuss the problem of financial assistance to meet the extra demand for books. His report would be sent to the DES as soon as possible. The DES may then, it is hoped, approach the local authorities on the matter.

THE CHAIRMAN, MR B. J. ENRIGHT (Sussex University Library) asked about the relation between non-book and book materials in the Open University Library and to the production of media materials. MR SIMPSON said that three groups were working at present: the BBC at Alexandra Palace; the Media Production Unit at Belgrave Square; and the Library and media resources unit at Walton. The library's function is to be interested in information on media. It will index it and draw attention to it when it is needed. It is necessary therefore to liaise closely with the Media Production Unit and with the BBC at Alexandra Palace.

MR A. J. DICKSON (Ealing Technical College) asked whether any attempt had been made to put set recommended books on PCMI (3,000 pages on one fiche). MR SIMPSON said that the PCMI reader is expensive and he did not think a reader should cost more than £20. He would only recommend one which could be used easily at home.

MR K. HENDERSON (Lambeth Reference Library) asked whether there would be some mechanism for expressing opinions on courses as seen from the librarian's point of view, and would such opinions be best expressed through the regional director or to the Ministry. MR SIMPSON replied that normally it would be necessary to go to the regional director. If more funds were needed, however, then one should approach the DES. It was possible for the regional directors to put some things right but not in cases where extra funds were needed.

Letters to the Editor

Dear Sir,

In the December issue of *Aslib Proceedings* you mention the 1969 edition of *ACCESS*. When I first examined this publication, I was very surprised to see only five British libraries amongst those whose holdings are listed. Of the five, only two appear to me strictly relevant to the purpose of *ACCESS*. The small number of British libraries is due in part to the fact that the Chemical Abstracts Service approached only a small number of libraries, but it is also due to the apathy of some people in the British library profession.

ACCESS is likely to be a very valuable tool to librarians throughout the world and I would like to see more British libraries represented. If any Member of Aslib knows of libraries that should be listed in *ACCESS* would he please let me know and I will then pass these suggestions to the Chemical Abstracts Service.

Yours faithfully,
R. G. GRIFFIN
Librarian

The Chemical Society,
Burlington House,
London W1V 0BN.
5th January 1970.

Dear Sir,

SEARCHING NATURAL LANGUAGE

The facilities provided in natural language information retrieval systems vary; the principal ones seem to be:

(a) searching on part of a word
  (i) on the beginning only
  (ii) on the end only
  (iii) on a specified string of characters irrespective of their location in the word
(b) automatically 'or'-ing synonyms of a word in the enquiry
(c) searching for two words
  (i) adjacent
  (ii) within N words of one another
  (iii) within the same sentence
  (iv) within the same paragraph
(d) using weighting in the enquiry

The first two are recall devices, the last precision devices. But how much, in fact, are such devices actually used? Are they, as were links and roles in their time, tools which seemed necessary to provide but seldom seemed necessary to use?

I am trying to build up a general picture of the way people do actually use natural language systems, and should be grateful if as many as possible users of such systems could let me know what facilities are used. If, in addition, any data is available to show how effective these devices are I should be even more grateful.

Perhaps I should add that I am not asking with any axe to grind, but, like Rosa Dartle, I only ask because I want to know.

Yours faithfully,
HELEN M. TOWNLEY (MISS)

117 West Wickham Chase,
West Wickham, Kent,
BR4 0BQ.
9th January 1970

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Recent additions to the Aslib library catalogue are broken down into twelve broad groups, whose coverage is indicated below. These groups are not mutually exclusive but it is hoped that users will find them helpful in scanning for new items of interest.

Note: These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory.

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres; management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

ELIZABETH MACK
Head of Library and
Information Services

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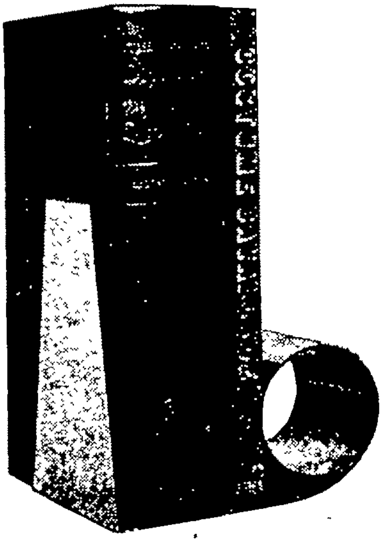

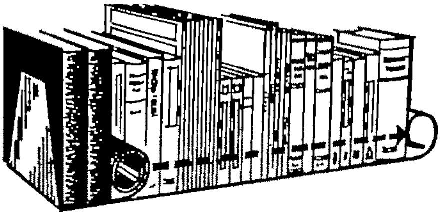

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Volume 22 **March 1970** **Number 3**

ASLIB CALENDAR 1970

April

WED.1–FRI.3	Aslib Chemical Group Course: Basic Chemistry. Courland Grove Hall, Wandsworth, SW8.
MON.6.	Aslib Transport Group Annual General Meeting, Sherry Party and Lecture. Aslib. 5 p.m.
WED.8.	Aslib Chemical Group Annual General Meeting and Annual Lecture: 'The oracles of the technological era', by E. F. Parker. Ivanhoe Hotel, London WC1. 11.15 a.m.
FRI.10–SUN.12.	Aslib Aeronautical Group Conference and Annual General Meeting. Cranfield.
WED.22.	4th Aslib Annual Lecture by Professor J. M. Ziman, FRS: 'The light of knowledge: new lamps for old.'
THU.23–SAT.25.	Aslib Joint Northern Midland Branch Conference. Derwentwater Hotel, Portinscale, Keswick.

May

THU.7.	Aslib Northern Branch Annual General Meeting. BISRA, Sheffield. 2 p.m.
THU.7–FRI.8.	Aslib Audio Visual Group Workshop. Aslib.
THU.14.	Aslib Engineering Group Annual General Meeting. Aslib.
TUE.19–WED.20.	Aslib Open Days. 3–6 p.m.

June

TUE.2.	Aslib Open Day. 3–6 p.m.
WED.3.	Aslib Annual General Meeting. 11.15 a.m. Open Day. 3–6 p.m.
FRI.5.	Aslib Technical Translation Group. French sentence competition. Aslib. 3 p.m.
WED.10.	One-Day Conference on International Developments in Scientific Information Services. Royal Society, London.
FRI.12–SUN.14.	Aslib Electronics Group Annual General Meeting and Conference. Overcliff Hotel, Westcliff-on-Sea.

New members

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(specialized Group interests are given after names, where relevant)

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Medical Research Council—Air Pollution Unit (*Bio*)	London	Miss S. J. Brenner
National Library of Canada (*Econ, Aud-Vis*)	Ottawa	Miss M. J. Higginson
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Aslib Open Days

What can Aslib offer you? Are you making the best use of the services provided? The four Open Days (19th and 20th May concentrate on what Aslib can do for industry, 2nd and 3rd June are directed to users in research, local authorities and the educational field) are designed to answer these questions.

From 3 p.m. to 4.30 p.m., members of Aslib staff will describe the research that is going on into information needs and modern information techniques and the kind of help the Aslib team of information specialists could give in planning or extending your own information service. They will also talk about the information service offered by Aslib and the latest developments in Aslib's training courses for specialist information personnel. There will be opportunities to ask questions as well as to listen, and from 4.30 p.m. to 6 p.m. members can visit the Library and examine its collection of literature on the collection, storage and use of information; see the Information Department at work; look at displays of educational material, course programmes and the range of publications—research reports, surveys, directories to sources of information and information manuals—that are available to members.

4th Aslib Annual Lecture

As announced last month, Professor J. M. Ziman, FRS, will deliver the Fourth Aslib Annual Lecture on Wednesday, 22nd April 1970, at 6 p.m. in the William Beveridge Hall, Senate House of the University of London (tea at 5 p.m. in the Macmillan Hall).

The speaker, who is Professor of Theoretical Physics at the University of Bristol, has given as his title 'The light of knowledge: new lamps for old.'

The Information crisis in science is usually regarded as a technical problem, to be 'fixed' with sophisticated hardware. But as science expands, its nature changes. Team research, government grants, page charges, and other bureaucratic developments are affecting the social functions of the information system. For example, the cost of publishing may be shifting from libraries and readers on to the 'producing' institutions, undermining the authority of editors and referees, creating difficulties for individual research workers and poorly endowed universities, and turning much of the literature into a superior form of advertising. Again, if all scientists are to be paid to do 'research', then none will be free to write review articles and books: the provision of research grants and paid employment for such writing may now be necessary. On the other hand, the importance of personal priority of publication may be diminishing. The underlying theme is that policies for the information system of science should take account of changes in the character and needs of the community being served.

International developments in scientific information services

It is a matter for some concern that so little is known about developments in scientific and technical information at international levels and, particularly, about the nature and work of the principal international organizations active in this field. The problem is common to most countries and Aslib's International Relations Committee, on which are represented the Royal Society, the Chemical Society, the Institute of Physics and the Physical Society, the Institution of Electrical Engineers, the Library Association, the British Standards Institution and the National Computing Centre, is one response to it.

Now, with the help of these bodies, Aslib is planning to hold a one-day conference on 10th June 1970, for the purpose of discussing the main international developments and trends in scientific information services and the British contribution thereto. The Royal Society has kindly made available the Wellcome Lecture Theatre in their premises at 6 Carlton House Terrace, London, and Professor Sir Harold Thompson, FRS, Foreign Secretary of the Royal Society and a Vice-President of Aslib, will preside.

Speakers from OECD, FID and other international organizations concerned will talk about intergovernmental plans and achievements; international co-operation among information scientists; the international pattern in subject and mission-oriented schemes; the feasibility of a world system; assistance to developing countries and the need for education, training and advice. The proceedings of the conference will be published and texts of the papers circulated to participants in advance. For further details, and a programme with a form of application, apply to the Conference Organizer, Aslib, 3 Belgrave Square, London SW1.

Midlands Regional Office

Considerable progress has been made since last October in establishing the office as a liaison link for the exchange of information between Aslib members and as a channel of communication between members in the Midlands and headquarters. A large number of liaison visits have been carried out and members have expressed their appreciation of the work of the office in helping them to take greater advantage of the wide range of services offered by Aslib. It is hoped that members will continue to play their part in ensuring that the liaison facilities provided are fully used, since decisions on the establishment of regional offices in other areas may well be influenced by experience gained in the Midlands.

In addition to visiting Aslib members, a number of valuable working contacts have been made with other organizations in the area. As part of the Construction Industry Advisory Service, Aslib Regional Office enjoys mutual co-operation with other members of the Advisory Service and with the information departments of the Engineering & Building Centre which has facsimile links with BRS, MPBW, TRADA, CIRIA, and seven other Building Centres in various parts of the country. A good deal of useful publicity in the press and in technical journals resulted from the official opening of the Advisory Service by Sir John Wolfenden, President of Aslib, last December, when over two hundred guests from all parts of the country were present.

Active consideration is also being given to the suggestion that a new branch be formed in the East Midlands, since experience has shown that existing travel facilities and the distances involved make it difficult for members in the Eastern part of the region to attend meetings in Birmingham as often as they would wish. The same problems are, of course, experienced by members living in the west when meetings are held in Loughborough and elsewhere. It is thought that a new branch with an active programme of meetings would be of benefit to existing members and also provide a valuable focal point for new members joining Aslib.

Initial response to the proposal has been encouraging and a questionnaire has been sent to all Aslib members in the East Midlands asking for their views. Additional comments or suggestions from other members would be welcomed and members are asked to telephone or write to Mr K. L. Wakelam, Aslib, The Engineering & Building Centre, Broad Street, Birmingham 1. Telephone: 021-643 1914.

Aeronautical Group

As announced in the January issue of the *Proceedings* the nineteenth annual conference of the Aslib Aeronautical Group will be held from Friday 10th to Sunday 12th April 1970 at the College of Aeronautics, Cranfield Institute of Technology, Bedfordshire. The conference fee will be £12 10*s*, including accommodation, meals and gratuities.

The conference will open on the Friday evening with the Annual General Meeting of the Group, and will be followed by a talk by Mrs W. I. Veasey of Blackwells on 'Bockseller-Librarian relations'. Papers on the Saturday will be presented by Mr D. Austin of the BNB MARC Project who will speak on 'An information retrieval language for MARC', by Mr L. G. Patrick on 'Some aspects of education for special librarianship' (which replaces the discussion by students of the College of Librarianship Wales announced in the January issue), and by Mr D. Pennington, Director of Industrial Liaison at Manchester University, on 'Technological forecasting.' There will also be a visit to the Cranfield Unit for Precision Engineering which will be followed on the Sunday by a talk on the work of the Unit by Mr J. Dinsdale, and a report of the progress in CRISPE (Computerized Retrieval Information Service on Precision Engineering) by Mr C. W. Cleverdon, Librarian of the College of Aeronautics. Also on the Sunday will be a talk by Mr J. F. Blagden, Manager of the Library and Information Services at the BIM, on 'Management Information Services'.

Mr E. J. MacAdam, Deputy Librarian at the College of Aeronautics Library, Cranfield, Bedfordshire, will be pleased to answer any further enquiries.

Audio Visual Group Workshop

A Conference/Workshop of the Aslib Audio-Visual Group will be held on Thursday and Friday, 7th and 8th of May 1970 at Aslib headquarters. The purpose of the workshop is to provide a forum for discussion between librarians who have been working with audio-visual materials, those who are now finding themselves faced with the problems which this type of librarianship poses, and the users of audio visual materials.

Speakers will include: Mrs Pamela Lea, Schools Services Librarian, Didsbury College of Education, Manchester; Mr L. J. Lawler, Director of Television Services at the University of Manchester and UMIST; Miss M. Slocombe, Librarian of the Sound Archives division of the BBC; and librarians working with slide and photographic collections. A visit has also been arranged to the National Audio-Visual Aids Centre of the Educational Foundation for Visual Aids.

Electronics Group Conference

The 12th Electronics Group Annual Conference will be held from Friday 12th to Sunday 14th June, again at the Overcliff Hotel, Westcliff-on-Sea. This hotel, pleasantly situated on the sea-front, proved quite popular last year. It is only two minutes from Westcliff Station, and there are frequent trains from Fenchurch Street, the journey taking forty-seven minutes.

The provisional programme includes a session with papers on management techniques and staff training applicable to libraries and information services, and a paper on Aslib's research activities by Mr B. Vickery, followed by practical demonstrations of some techniques in operation in certain Ministry of Technology libraries. The technical papers, always a much appreciated and enjoyed feature of the programme, will be on air traffic control and on electronic devices for security purposes.

The Annual General Meeting of the Group will be held as usual on the Saturday afternoon. The Conference fee is 10 guineas but this is reduced to £10 for fees paid by 14th June. The Conference Secretary is Mr J. E. Wright, Librarian, c/o The Institution of Electrical Engineers, Savoy Place, London WC2.

Five Specialized Information Centres

A limited number of the OSTI Report No. 5050 of October 1969 entitled *Five Specialized Information Centres: a report by Aslib to the Office for Scientific and Technical Information,* by S. E. Robertson and R. Reynolds, is now available from OSTI on request. It has also been deposited at the NLL and is available on loan.

Information Officers in University libraries

OSTI has recently launched an experiment to evaluate the role of information officers in exploiting university library resources and in introducing new information services to university users. Six information officers have been appointed at the libraries of Birmingham, Salford, Strathclyde and Sussex Universities, Imperial College, London and University College, Cardiff. The experiment, which began in January 1970, will last for five years.

Each information officer will be involved in the education and training of academic staff and postgraduate students in the use of information resources and will also give help, where required, to those responsible for introductory courses for undergraduates on library use. He will also promote effective use of information services, both traditional and mechanized, particularly by liaison with specific mechanized services.

It is intended that the information officers will meet these objectives through formal courses of instruction and by giving advice on information problems, in the natural and social sciences and in technology, brought to them by individuals.

Assessment of these experimental services will be carried out by Aslib's Research Department. The Department will draw on the reports of the information officers in its assessment of the project and regular meetings of the six will be held by OSTI to co-ordinate their respective approaches to the experiment.

OSTI hope to release further information at intervals on the progress of the experiment.

Practical problems in special libraries

The School of Librarianship at Ealing Technical College is planning to hold a one day meeting on the subject of practical problems facing the staff of special libraries. The meeting is directed at young librarians and information workers who have a measure of responsibility and have had administrative and service problems that may or may not have been solved.

A panel of experts will comment on any question submitted, supported afterwards by general discussion. Providing there is sufficient response this event will take place at Ealing during the latter part of June 1970.

Ex-library school students and others who would definitely like to participate should write to Mr J. Burkett, MA, FLA, Principal Lecturer, Ealing Technical College, St Mary's Road, Ealing, W5.

Library Association Cataloguing & Indexing Group

The Cataloguing & Indexing Group is holding its Seminar for 1970 at Pantycelyn Hall, University College of Wales, Aberystwyth from 10th to 13th April. The meeting is entitled 'Subject to Information' and will serve as a review of subject cataloguing and information retrieval from the beginning of the century until today.

The Group Committee has invited those engaged in professional education and experts who have made their own contributions to developments to speak on subjects ranging from traditional subject cataloguing in America to the relationship of thesauri to the structure of classification schedules. Papers will also explore the effect of automation upon subject information retrieval.

The fee for the Seminar is £12. Application forms can be obtained from the Honorary Secretary, CIG, c/o BNB, 7 Rathbone Street, London W1P 2AL.

Library and Information Science Scholarship Today

A group of staff and students at the University of Maryland's School of Library and Information Science are proposing to publish a new and comprehensive list of research activities in progress in librarianship and information science. It is known as the LISST Project (Library and Information Science Scholarship Today) and it is hoped that information from the questionnaires now being sent out will be made available in some form of periodical publication similar to *Current Research and Development in Scientific Documentation.*

Those wishing to have their work listed in this publication should contact: Library and Information Science Scholarship Today, School of Library and Information Services, University of Maryland, College Park, Maryland 20742.

Second CODATA Conference

The Committee on Data for Science and Technology (CODATA) of the International Council for Scientific Unions is to hold its Second International Conference on Numerical Data for Science and Technology, at the University of St Andrews from 7th to 11th September 1970.

CODATA was established in 1966 to stimulate and co-ordinate world-wide effort on the compilation of critically evaluated numerical data for science and technology. Its conferences are designed to bring together users of numerical data and representatives of organizations responsible for the establishment and management of data-compiling groups and data centres.

Those interested in attending should write to Mr N. H. Robinson, British National Committee on Data for Science and Technology, c/o Royal Society, 6 Carlton House Terrace, London, SW1.

American National Information System for Physics

With support from the National Science Foundation, the American Institute of Physics has been planning a National Information System for Physics since mid-1966. The AIP are now able to implement these plans by offering new information services in this field.

At present a large computerized file of physics information is being developed at the AIP, based on a prototype model developed at the Technical Information Project at MIT. As a record for each journal article, the file contains bibliographic information, abstract of articles, indexing information, and citations of the article to other literature. About half of the world's primary physics literature is being classified and entered by AIP into the computer file, and during 1970 four services will be produced from this file:

1. A magnetic tape service consisting of monthly copies of recent additions to the file.
2. A current awareness journal, *Current Physics Titles,* which will be issued initially in four sections, and a library edition containing all the sections. The four sections will be: (a) Particles, fields and nuclei; (b) Atoms, molecules, plasmas and fluids; (c) Solids; and (d) Acoustics, optics, astrophysics and geophysics. Further sections will be added in due course.
3. A series of bibliographies in various special areas of physics, updated at intervals.
4. Computer assistance to the production of indexes for the various AIP journals.

Once the initial services are established additional services will be introduced, including retrospective literature searches on demand and selective notification of lists of articles of particular interest to groups. At the same time the coverage of the system will be increased to almost all the world's primary physics literature.

For the future the AIP envisages a series of information centres, each with copies of the central file of physics information, and each supplying information in a number of disciplines and interdisciplinary combinations.

Further details can be obtained from the American Institute of Physics, 335E 45th Street, New York, N.Y. 10017.

International Nuclear Information System (INIS)

At the beginning of May 1970, INIS, a new International Nuclear Information System for identifying published information about nuclear science and its peaceful applications, will send out its first products. INIS, a computer-based system set up jointly by the International Atomic Energy Agency and its Member States, will be announcing most of the world's literature dealing with reactors and reactor materials; uranium production and fuel cycles; nuclear techniques in food and agriculture; health, safety and waste management; isotope production; industrial applications of radiation; peaceful nuclear explosions; and safeguards, legal and economic questions.

The main product of the system will be the INIS ATOMINDEX, a computer printout giving bibliographic descriptions and keywords for all items reported to INIS. Eight issues of ATOMINDEX, plus an annual index, will appear in 1970. Also available will be the abstracts accompanying each item reported to the system. These will be converted to microfiche and sent out in eight batches during 1970. Finally, full texts on microfiche of items reported to the system that relate to non-conventional literature (e.g. technical reports, patents and theses) will also be available to subscribers.

Further information and subscription rates can be obtained from INIS section, International Atomic Energy Agency, Karntner Ring 11, P.O. Box 590, A-1011, Vienna, Austria.

Chemical Abstracts: Index Guide

An Index Guide for *Chemical Abstracts* is now available from Chemical Abstracts Service. The new guide, which was produced and distributed as part of the Subject Index for *CA*'s volume 69, contains all the cross references, scope notes, and synonyms currently used in the *CA* subject indexes. It also includes an indexed compilation of some 22,000 illustrative structural diagrams that have appeared in the *CA* indexes since 1907.

Copies of this guide may be obtained for $25 each from Subscription Fulfillment, Chemical Abstracts Service, University Post Office, Columbus, Ohio 43210.

BRIEF REVIEWS

BAKEWELL, K. G. B. How to find out: management and productivity. A guide to sources of information arranged according to the UDC. 2nd edition. Oxford, Pergamon Press, 1970. 389 p. 30*s*. (SBN 08 006688 7.)

This is the second edition of the book first published in 1966. The layout and content are basically the same as the first edition. Sources of information have been brought up to date and some of the chapters expanded, and the index is more detailed. The chapters are still arranged in UDC order.

The aim of the book is to list sources of information on all aspects of the management and productivity field, and the subjects covered include careers in management, periodicals and abstracts, and financial management and accounting; there are also three appendices on statistics, directories, and law. Where sources are self-explanatory, discussion is brief; where detail is necessary, the author provides it objectively.

The book should prove to be a most useful, up-to-date source of information, not only for management students, for whom it is primarily intended: its potential as a reference book for librarians and information officers is clear.

CURRENT BRITISH DIRECTORIES: a guide to the directories published in Great Britain, Ireland, the British Commonwealth and South Africa. 6th edition, 1970–71. Compiled and edited by G. P. Henderson and I. G. Anderson. Beckenham (Kent), CBD Research, 1970. 284 p. £6. (SBN 900246 04 9.)

This directory is arranged in three main sections: Part 1, local directories; Part 2, specialized directories; Part 3, commonwealth directories. The local directory section is arranged alphabetically by locality, the specialized directories are alphabetical by title and the third section is divided by country. In previous editions of the publication a list of international directories has appeared but this is now covered by the new publication of CBD Ltd, *Current European Directories.*

The details given for each entry include name, address and telephone number of publisher, first edition, latest edition with price, type of contents and languages used. There is a complete subject index to the directories in English and a separate index in English, French and German to selected important titles. There are ample cross references in the main text and the indexes.

This new edition will prove very welcome to libraries and all those using directories or compiling lists. It is extremely comprehensive and the editors claim to be personally familiar with most of the directories.

HOLM, BART E. How to manage your information. New York, London Van Nostrand–Reinhold, 1969. 299 p. 93*s*.

The book discusses simple, practical principles and techniques for the engineer, chemist, physicist, architect, doctor, archivist and other professionals, to help each manage his own information. Chapters covering: how to keep current with literature, modern library practice, efficient records management, the use of microforms, the handling of chemical structures, and the establishing of data systems, complete this comprehensive work.

INSTITUTET FÖR BYGGDOKUMENTATION. Abstract and index publications for the building industry. Stockholm, The Institute, 1969. 56 p.

156 current abstract and index publications are listed 'of interest for builders'. The main listing is arranged in UDC order and ranges from 33—Economy to 728—Housing. Each entry gives information regarding such things as size, format, arrangement, index, classification (if any), language, frequency, publisher and price. There is a second listing by country (the UK leads with twenty-eight titles) and an alphabetically arranged title index.

MARTIUS, THEODOR, *comp.* Dictionary of International Fair expressions. In 3 parts: German/French/English. Leipzig, Veb Verlag Enzyklopädie; London, Wellingborough, Collet's, 1969. 1228 p. £7 15*s*. *the set.*

This dictionary is in three volumes: Part I, German–French–English, was published in 1967, Part II, French–English–German, appeared in 1968, and Part III, English–French–German in 1969, all in Leipzig. The three versions are arranged side-by-side on the page and are easily distinguishable. The subjects covered include stand construction, business procedures and press work, as well as more general trade expressions and new terms relating to Fairs.

Although the instructions for use of the dictionary are rather ponderous, words and phrases are simply to be found in strict alphabetical order. The Foreword states that this is the first comprehensive dictionary of Fair terminology to be published, and as such fills an important need.

NAYLOR, MARGOT, *ed.* Financial Times Yearbook: business information. London, Longmans, 1969. 379 p. £3. (SBN 582 12651 7).

The *Yearbook* gives economic information on twenty-five major countries. Data for each country include population, standards of living, government expenditure, money supply etc. Much of the information is presented in tabular or graph form.

There are sections in the publication for international comparisons and international economic blocs. Almost a quarter of the volume is devoted to the United Kingdom for which extensive information is given: for example, data on labour relations, commodity markets, the stock exchange, insurance and the police force are given for the UK. As for all countries, figures are brought together from a number of different sources which are cited.

A business vocabulary in English, French and German is included. There is no index, but a contents list appears at the beginning of the section on each country. This new publication will be particularly useful for the economic information it contains on the United Kingdom and its international comparisons, which is at present not available in any other single source.

ROBERTS, MICHAEL *and* EMENY, ROGER. Lands Tribunal Index 1968. Prepared for the Royal Institution of Chartered Surveyors Technical Information Service. London, RICS, 1969. 42 p. 25*s*.

This publication covers Lands Tribunal cases in 1968, and there are three thousand references in the index to 175 cases; if an appeal has been made this is indicated. Indexes make it possible to trace a case if any of the following details are known: name of first or second party, the town in which the property is situated, statutes mentioned in the decision or other cases mentioned, the type of case and keywords used in the decision, e.g. house, light, size, wind.

The authors hope that, with sufficient support, the Index will be brought up to date annually. At the moment they are working on the compilation of cases from 1963 to 1967 and for 1969, and cumulative indexes are anticipated. This publication should prove extremely useful to those who need to trace decisions made by the Lands Tribunal.

WALMSLEY, STUART H. *ed.* 1969 Chemical Industry Handbook. London, Macdonald, 1969. 467 p. £5. (SBN 356 03119 5.)

The first three editions of this handbook were privately published. With the fourth edition it has become generally available to the public. The handbook follows the general pattern as in the previous editions but coverage and scope have been extended. Emphasis is on the UK chemical industry but world figures are also included.

The publication is arranged in four parts. Part 1 presents the general statistical background of the industry. Part 2 contains articles on some important sections of the UK chemical industry, written with the primary intention of providing information for the investor. The major new sector to be covered is the paint industry, and, for the first time, a chapter covering the statistics of various other sectors of the chemical and allied industries, and a section on petrochemicals in the chapter on the oil industry, have been included.

Part 3 gives an analysis of companies and for the first time includes some information on various unquoted private companies which play an important part in the chemical industry. Part 4 contains seven appendices, which include 'UK chemical company share price indices and yields', and 'Guide to prices of chemicals'. Details of the sources of information for the latter appendix are given.

CLASSIFICATION AND INDEXING IN THE SOCIAL SCIENCES

D. J. FOSKETT
University of London Institute of Education

Paper presented at a meeting of the Social Sciences Group, Wednesday 10th December 1969

IT would indeed be pleasant to be able to begin this paper with the relation of many striking and significant advances made since I last spoke on the topic to Aslib, at the 1965 Annual Conference at the University of Keele. Such, alas, is not possible; it would not be too much to say, of the social sciences as a whole, what R. B. Joynson has recently said of Psychology: 'The present sub-divisions of Psychology are not, for the most part, the fruit of any agreed and deliberate analysis. They are historical flotsam—a haphazard collection of topics . . . brashly inflated by a hand-to-mouth empiricism into one great blooming buzzing confusion.' Although there are a few bright patches of orderliness, I fear that much of our subject presents something of the same confusion; while I am certain that the same hand-to-mouth empiricism is earnestly providing classification and indexing with more than its fair share of historical flotsam.

Before I examine the present situation in detail, I should like to take a few moments to make clear my own position. I like to think myself a reasonably practical chap, one who, in his ordinary daily life as a professional librarian has to deal with the information needs of an academic community; who is, either directly or indirectly through my colleagues in the Institute of Education Library, fairly well aware of the way in which staff and students in our Institute seek to remedy gaps in their knowledge by means of the specialist literature. These students range all the way from beginners (that is, student teachers in training) to advanced workers and professors with many years of experience, some of whom are world-recognized authorities. Some of the senior citizens among you may perhaps remember that, once upon a time, I was also in charge of an information service in industry, serving a Research Department full of scientists and engineers, and also doing our best to provide information to the chap at the coal face—the man on the actual factory floor, who made the product. I have not, therefore, arrived at my present views by way of a life of contemplation (though I must confess, in parentheses, that I have always been a devoted adherent of the Law of Least Effort); what I have to say now may well appear to be 'academic theory', in the worst sense of being unrelated to the harsh realities of life, but it is in fact based on, and reinforced by, a not inconsiderable deal of practice in many different subjects.

I am convinced, then, of two major principles: first, that libraries and information services are bound to become more and more important to subject specialists as more and more documentation accumulates, as we know more and more about everything; and second, that we can only perform effectively if we get to grips with the structure of subjects so that we understand them, and can talk sensibly about them. I do not, of course, mean that we have to be more expert than the experts—the pathetic fallacy of some information officers. We do not have to tell the experts what they should, and what they should not, read; what we have to do is to acquire an insight into the way in which they think about their work, so that when they put an enquiry to us, we are able to fit it into the corpus of knowledge which resides in the documentation, and pull out the appropriate answers. We need to understand both 'relevance' and 'pertinence', and the important difference between them. 'Relevance', of any piece of knowledge, means that it can be seen to fit in with the general pattern of a larger area, that it is a recognizable and recognized part of the consensus among experts in that area; but 'pertinence' means that it fits in with the particular pattern that one individual is trying to construct in his own mind. Relevance is what determines the contents of any published indexing or abstracting service, for example; the compilers are not relating their selection of material to any one individual, but to a consensus. Pertinence, on the other hand, is what determines the selection offered by a librarian or information officer to a specific enquirer, which is a more subjective, less consensible, matter. It could reasonably be said, I think, that the contribution an individual makes to the advance of knowledge may be judged by the extent to which he succeeds in transforming what is pertinent to him into what is relevant to the consensus.

For these reasons, I consider that it is of the utmost importance that we should not only keep up to date with the discussion of the philosophers, but also perceive their relevance to our daily practice. This is the objective of the Classification Research Group, and is embodied in two forthcoming publications by the Library Association.

What is, perhaps, too often forgotten is that the great achievement of Melvil Dewey lay precisely in this: that he used the scientific method for determining the collocation of *subjects*, that in freeing libraries from the restraints of fixed location, he was actually transferring the application of classification to the handling of subjects instead of objects—books (or any other documents). He was concerned with information; and the way in which he tackled this was to introduce, into the arrangement of information, the method of the classificatory sciences, that is, the display of the genus-species relation. The arrangement was mechanized by the decimal fraction notation:

Subject	*Notation*
Mammals	599
Primates	599.8
Apes	599.88
Gorillas	599.884

Monographs on these entities therefore exhibited, on the shelves, the same helpful sequence that would be used by a biologist in discussing them. What has gone wrong with the subsequent development of DC, and the other traditional classification schemes, is that they have failed to incorporate the advances in scientific method, and have tied themselves too tightly to the single generic hierarchy, which means that complex subjects are now treated as if they were, in fact, objects, and therefore capable of being dealt with in the same classificatory way. Thus, in the recent new edition of UDC Class 37, we find:

Subject	*Notation*
Education	37
Fundamental forms of education	37.018
School education	37.018.2
Attitudes of parents to school	37.018.26
Parent–teacher relations	37.018.263

Clearly, this is not a generic hierarchy, in that neither of the last two subjects can be called a 'species' of its predecessor, but both in schedules and in notation they are presented as if they were. Several simple terms, such as 'attitudes', 'parents', and 'teachers', have been pre-co-ordinated in a rather arbitrary manner. The unfortunate classifier has the task of fitting the literature to the classification scheme, and not the other way about.

Modern schemes for classification have tried to overcome this problem by the introduction of greater flexibility in concept co-ordination. The ultimate extent to which this technique can be taken, of course, is the completely free choice of terms from any document to be indexed—the use of natural language in an uncontrolled form. The problem then arises that we can never actually find uncontrolled vocabularies, since what we have is authors' vocabularies, which are controlled by the author, and, as is well known, different authors use different systems of control. In some fields of knowledge, particularly the physical sciences, what Pantin calls the 'restricted' sciences, it may be that the vocabulary has reached a high degree of consensibility; but, as we all know, this is far from being the case in the social sciences. To take a simple instance: the use of natural language for an index in Education would result in a term like 'public school' recalling the exact opposite of what was required by an American searching English journals, and vice versa. Any science advances, as Ziman points out, to the extent that it becomes 'Public Knowledge', and it can do this only if there develops an agreed terminology. An agreed terminology is a controlled vocabulary; and those information specialists who claim to use an uncontrolled vocabulary, when what they mean is the natural language of authors, are deceiving themselves, and the truth is not in them or their indexes.

It is at this point that I think I can appropriately introduce a well-known but very basic distinction, one which has often led to confusion, and which could easily trap me in a contradiction if I were to ignore it. This is the distinction between that class of information which we usually call 'data', and that class of information which we usually call 'information' but which should really, to preserve the distinction, be called something like 'discussion'. I do not need to elaborate on this; although it may be utterly metaphysical to draw a hard and fast line between the two, none the less for the purpose of this argument, I must distinguish between the sort of data that are provided, say, by census returns (i.e., numbers of individuals, broken down by work, age, sex, etc.), and the sort of discussion found in an article dealing with the influence of broken homes on the incidence of juvenile delinquency, in which all kinds of imponderables may be considered, probably in a highly uncontrolled vocabulary.

Data Banks are at last being set up by a number of centres to collect and store in machine-readable form this type of precise and highly specific information, which is amenable to computer handling, being readily codable in terms of 'bits'. This is a very desirable development, and the International Social Science Council has paid attention to it for several years; it has held meetings and conferences, and the reports appear from time to time in *Social Sciences Information*—that excellent journal to which we in this country contribute far too little. Compilations of this kind present few indexing problems, for the very reason that, because they deal with precise, quantified, information, their data are already classified—arranged under the most useful headings—and their terminology is well-defined and carefully used. Classification has an important rôle, but it is as a tool in the hands of the compiler, rather than of the classifier and indexer. I would not wish to underestimate this rôle, but fortunately it has been very well discussed by Michael Phillipson in his PEP Report, *Making fuller use of survey data*. 'The study has reinforced the view', he concludes, 'that orientation to the needs of users is of first importance in the design of a classification system, particularly in the light of the special problems inherent in the need to be able to convert the everyday language of raw survey material into the more specialized technical and conceptual language demanded by a range of users, academic, marketing and administrative'. Even here, the central operation in the information retrieval process is the matching of enquirer's terms with author's terms.

In my book, *Classification and indexing in the social sciences*, I examined the main general schemes of classification and their treatment of the social sciences, and it is unnecessary to repeat that here; very little new has been published since then, although the UDC has come up with a revised edition of class 37, which shows some improvements over the old, but still goes in for far too much pre-coordination, and has introduced some very vague headings, such as 'Indirect functional education', 'Over-expansion of education and other policy errors', 'Symbiotic arrangement of subject material within the programme', and the like. Such improvements as there are depend mainly on the increased tidying up made possible by more systematic sorting out of the terms into recognizable categories or facets. The view that facet analysis provides a sound basis for all forms of information control has now won wide acceptance, even in the USA, in the large programme of the American Institute of Physics, for example, and the Biological Sciences Communication Project at George Washington University, recently reported by T. W. Caless in the *Classification Society Bulletin*.

Work has continued in the UK in special fields. Helen Tomlinson made an analysis of concepts in Politics for the CRG, and her paper will be included in the collection to be published by the LA. OSTI has supported two projects in the field of Business Studies and Management: a faceted classification made by K. D. C. Vernon and Valerie Lang at the London School of Business Studies, and a thesaurus compiled by J. F. Blagden at the British Institute of Management. A third project, in Sociology of Education, aims at establishing a comprehensive abstracting and indexing service, and Miss V. Winn is developing a classification as part of the study, at the Institute of Education of the University of Oxford.

There have also been some new efforts in computer-produced indexing. Since

I am convinced of the need for controlled vocabularies, it will surprise no one to hear that I regard KWIC indexes as of doubtful value in the form in which they are often produced: as a subject index to a bibliography arranged in alphabetical order of authors' names.* The lack of even the most elementary references, from synonyms, let alone to related terms, the failure, or rather the absence of intention, to provide any sort of guide to help the user to structure his thinking, seem to me to be a retreat from all that good indexing sets out to be. Where this technique is used to provide a subject index to a classified arrangement, of course, this criticism does not hold to the same extent, though one can still easily overlook pertinent and relevant items through not happening to think of the same word as an author has used in his title.

An attempt to overcome these disadvantages can be made in several ways. One that lets the computer do a good deal of the work is the KWOC (Keyword Out of Context) Index. Wayne State University has produced one of these in the now fashionable subject of the *Culturally Disadvantaged.* This consists of four main sections: an Index of Keywords, where the titles-cum-subject analyses of relevant articles are listed under each word, together with the address in the bibliography; the Bibliography itself, where the full reference is given under the address code; an Author Index, which lists against each author's name all the addresses at which his works will be found; and a Subject Index, which is simply a list of all the terms used as headings in the Index of Keywords.

This is a multi-entry index; that means that it follows the original KWIC technique to the extent that the subject analysis is repeated (though not the whole entry) under each keyword which the indexer thinks might be used as a sought term. At each keyword, extra words not in the title of an article are added to clarify the relevance of the article to the keyword, or to give bibliographical information about the article ('statistics', 'research', 'bibliography'). This is a decided improvement over the KWIC index, but it can still be somewhat cumbersome to use; the Subject Index is a help in that it takes little time to run one's eye down the columns, but some cross-references would surely have helped still more. Using the Author Index or the Index to Keywords necessitates hopping from here to there in the Bibliography, having for a guide a complicated set of symbols, some of which in fact are not needed as locating devices, since they indicate the date of publication of the article and the initials of the first three words of the title. Some classification in the Index to Keywords and Subject Index is achieved by concept pre-co-ordination: CULTURE-FAIR is followed by CULTURE-FAIR TESTING and CULTURE-FAIR TESTS, for example.

One of the most significant projects, mainly because of its large scale, is the ERIC system, now in full operation, with the US Office of Education linking up some twenty specialized collecting and indexing centres at various universities in the US. This 'Education Resources Information Center' brings out two main publications: *Research in Education,* which lists report literature (in vast, non-evaluated quantities), and *Current Index to Journals in Education,* for literature published in periodicals. Both are compiled on a computer, and printed by photocomposition, and the indexing is based on the *Thesaurus of ERIC Descriptors.* The first draft of this thesaurus was a single alphabetical list of terms, obviously compiled with no structure in mind, and therefore open to all sorts of criticisms. The revised version took account of some of them, and now includes, for example, a set of Descriptor Groups, which can hardly be called facets, but which do allow the Main Entry Section of each issue to display a simple form of classification, so that one can browse to a certain extent for current awareness purposes. Under each entry are listed the thesaurus terms by which that entry has been indexed, plus a few more to indicate more precisely its contents. Some proper names, such as the names of countries, may be found in these lists, enclosed in square brackets, which indicates that such terms have not been taken from the ERIC Thesaurus.

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* Dr R. T. Bottle informs me that forthcoming articles of his show clearly the very poor results given by KWIC indexes in American History (77 per cent indexable information not retrievable from title), Patents (42 per cent), Engineering (38 per cent), and, rather better where the vocabulary of titles is likely to be more specific, Chemistry (23 per cent).

This index is fairly easy to use, but the selection of subject headings for the main entries is often baffling. In the July 1969 issue alone, there are seventy-nine items entered under the term 'Education' itself, which is surprising enough; but when one examines the actual entries, one finds such titles as 'Admission of women to the University of Missouri in 1868', 'New policies for Cuban education', 'Sex education and the physician', 'Classroom out-of-doors', 'French art education', and so on. One recognizes fully the difficulty of gaining consistency when the indexing is done at nineteen different centres, but to enter such a hotch-potch as this under one heading, let alone the non-heading (in this context) of Education indicates a lack of rules of the type that any good modern classification scheme would have not only built in, but also explained in detail in its scope notes. The fault is underlined in the Subject Index, which is all the more inexcusable since this is where the multi-facet approach has its chance. One finds under Comparative Education such items as these (it has no section to itself in the Main Entry Section):

New policies for Cuban education
Teaching and learning in Finland
French art education

Several pages further on, in the Subject Index, one finds entries like these:

Library education in West Germany
What Americans can learn from the Danes
School library workshop in Nigeria

There are no references from either of these headings to the other. All of the items are actually scattered about the large section under 'Education', but it is clear that the indexers of Comparative Education material follow a different policy from that of the indexers of Library material.

I should mention that the ERIC Thesaurus is not to be confused with another in the same subject, which is a more systematic attempt to divide the field into a set of mutually exclusive facets: the *Information Retrieval Thesaurus of Education Terms,* by Gordon C. Barhydt and Charles T. Schmidt, published by Case

Western Reserve University in 1968. This was devised for ERIC, but is not used by it.

It will be clear, of course, that although these two indexes have each purported to cover a fairly well-defined part of the social sciences, they have both in fact ranged far and wide over the whole field. This is only to be expected, for nowadays there is much crossing-over and blurring the boundaries of the traditional 'disciplines', and nowhere is this more advantageous to the user than in indexing. If one looks at the Engineers Joint Council thesaurus, or the Medical Subject Headings used by MEDLARS, one can see that they too overlap into the social sciences, because the implications and consequences of their science have much to do with the science of Man.

When we come to a project covering the whole of knowledge, such as the MARC Project of the Library of Congress and of the *British National Bibliography*, then the social sciences are sure to demand a considerable part of the effort. After several years devoted to the investigation and construction of specialist schemes, the CRG came to the conclusion that what was needed was not the proliferation of special schemes all coping inadequately with the problem of marginal and related fields, but an attack on the much more difficult task of elaborating a systematic structure for the whole of knowledge. At first, we called this a project for a general classification scheme; now, moving with the times, we talk about a general indexing language for information control. This is, after all, what we are looking for. If we accept what is now a commonplace, that the function of an information officer is to match the gaps in a user's mind with the information that is in the store, then we must surely accept that the closer the tailoring of the stored information to the shape of the user's mind, the better will be the fit. Even if it is the information officer that does the tailoring, he too will be helped if his materials are arranged in systematic order, and not piled up in disordered heaps (like information in an alphabetical subject index). It seems to me wrong to assume, as the editor of one KWIC Index says, that it is up to the user to have the concepts in his mind already, and that it is no part of an indexer's job to help people to think about their subject. To put it at its lowest, we help ourselves to think about the user's subject if we can run our eye over the schedules of a faceted classification.

I believe, then, that even in the electronic era, with the possibility of multi-entry indexes, there is a most important rôle for classification, or systematic concept co-ordination; it will provide us with a refined language in which to conduct our dialogue with the computer, and, if properly constructed, will help to eliminate some of the noise that is so deafening nowadays in certain well-publicized computer systems.

But what is 'systematic concept co-ordination'? CRG research in recent years has studied the application of two complementary theories, Integrative Levels and General Systems Theory, to the construction of a formal language covering the whole of knowledge. I shall now try to illustrate these, briefly, by relating them to the social sciences.

In applying facet analysis to a special subject, one has the great advantage of knowing where to start. One goes to 'the literature of the subject', and provides a scheme that will offer a place to all the terms found there. In the social sciences, therefore, one might start with terms like Politics, Economics, Sociology.... But shall we include Anthropology? or only Cultural Anthropology? or Psychology? or History? We cannot so easily wriggle out of the task of defining the boundaries of the field. Barbara Kyle was the first to decide to start from scratch, as it were, and abandon the traditional disciplines. But if a classification scheme has no Main Classes, what is the starting point for the facet analysis? Ranganathan himself has avoided the issue by resorting to 'postulating' Main Classes, but the CRG felt that there is a better answer waiting to be discovered, and decided to build on the idea of the Fundamental Categories, particularly that of Personality. In the Colon Classification, it is the Personality facet that comes first, and the nature of the concepts in the the [P] facet actually determines the Main Class, even though in CC it usually appears to be the other way about. [P] facets contain those terms that are the primary focus of study in any given field.

Now if we want to start classifying the whole Universe about us, we soon find that what we have the most specific knowledge of are the objects around us in our daily life, and that it is by classifying these that we are able to live successfully. Modern psychological research, in particular that of such people as J. S. Bruner, J. P. Guilford, and Jean Piaget, has shown that it is by investigating the immediate surroundings and constructing conceptual schema that the child comes to understand his world and to develop the capacity to abstract, and thus to predict—to be able to deal with circumstances that he has never met before. It is obvious, however, that these familiar objects, or entities, themselves derive from other entities already in existence; we cannot classify them accurately without taking those other entities into account. The chair comes from the timber, the timber from the tree, the tree from the seed, and so on.

Integrative level theory suggests that entities can be ordered into a linear sequence like a sequence of Main Classes in a classification scheme; the entities at each level can combine together to form new entities, new wholes that have a separate existence as single units, though made up of a number of what have previously been recognizable as themselves separate units. The constituent units, plus the relations that come to exist between them and bind them together, determine the nature of the new, higher level, unit; the whole is greater than the sum of its parts. The application of this theory to the social sciences can certainly be traced back to Durkheim, though its general application was earlier pointed out by Engels, in *Dialectics of nature*, and Sir Cyril Burt has recently attributed it to G. H. Lewes' *Problems of life and mind*. In his *Rules of sociological method*, Durkheim emphasizes very strongly the value of classification in social science research, not only for arranging what has already been described, but also to 'facilitate scientific work by substituting a limited number of types for the indefinite multiplicity of individuals', and this will make a framework to guide the observer in his investigations. He then goes on, in speaking of social groups, 'Since the nature of the aggregate depends necessarily on *the nature and number of the component elements and their mode of combination*, these characteristics are evidently what we must take as our basis; and we shall see from what follows that it is on them that the general facts of social life depend'. As Durkheim, and many others after him, have never failed to observe, one must at all costs avoid the vice of reductionism, that is, in the sense used in Arthur Koestler's latest work, *Beyond reductionism*, 'the philosophical belief that all human activities can be reduced to (explained by) the "elementary responses" displayed by lower animals (such as the psychologist's laboratory rat); and that these responses in turn can be reduced to elementary physico-chemical laws'.

Integrative level theory provides a set of hypotheses to account for this belief that units which exhibit a particular mode of organization of their parts cannot be fully explained by the analysis of those parts, and what we have to do in the social sciences is to look for the basic unit. I suggest that it is the individual human being, not as himself the object of analysis (unless we wish to include Psychology), but in the ways in which he joins up, or relates to, other men to form groups of people that exhibit characteristic modes of behaviour. Details of these are discussed in many large volumes, but for simplicity of demonstration, I will propose the following:

Biological, Linguistic, Spatial, Occupational, Mental/Spiritual, Recreational (Fig. 1).

These are roughly based on what are called 'tissue needs' by James Feibleman, whose *Institutions of society* is a good example of a philosophical survey of the social sciences from the viewpoint of integrative level theory. We have had an exercise of this nature lately in the Redcliffe–Maud Report, which has tried to find out the appropriate level of entity for British local government.

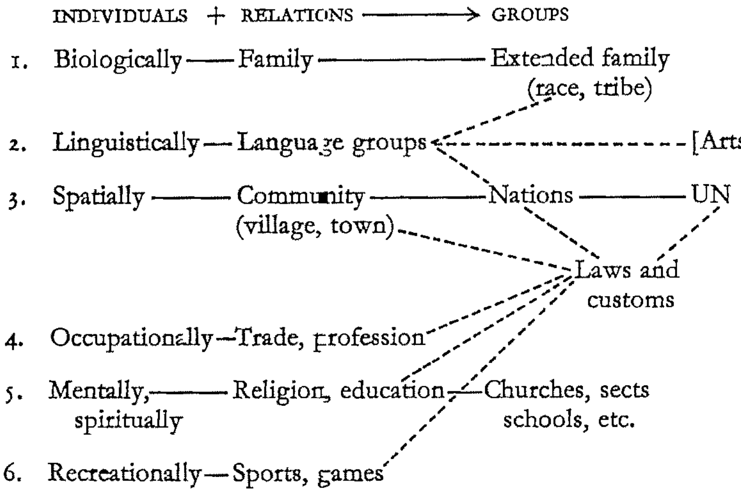
INDIVIDUALS + RELATIONS → GROUPS
1. Biologically — Family — Extended family (race, tribe)
2. Linguistically — Language groups — [Arts]
3. Spatially — Community (village, town) — Nations — UN
Laws and customs
4. Occupationally — Trade, profession
5. Mentally, spiritually — Religion, education — Churches, sects schools, etc.
6. Recreationally — Sports, games

FIG. 1

Integrative level theory, then, may provide a systematic method for the location of starting points (or Main Classes, in the old term), and the set of entities that one finds at each level would then correspond to a Ranganathan-type [P] facet. The next step is to discover how to analyse the entities and the relations between them.

It is here that General Systems Theory has begun to play an important rôle. This theory was first advanced by Ludwig von Bertalanffy in the 1930s, but it has undergone considerable development in the USA, by Bertalanffy and others, and D. W. Austin has succeeded in applying the idea to classifying in his work for the BNB MARC Project. According to Bertalanffy's definition, General Systems Theory is 'a logico-mathematical field, the subject matter of which is the formulation and deduction of those principles which are valid for "systems" in general . . . whatever the nature of their component elements or the relations or "forces" between them'. We can speak, for example, of 'active' or of 'passive' systems; in such a subject as 'the influence of broken homes on the incidence of juvenile delinquency', we can see that 'juvenile delinquency' (that is, the behaviour pattern of juvenile delinquents—a group of young people with characteristic relations with Authority) is in this sense a 'passive' system, while the 'broken home' element is the 'active system', because it is the one that is doing the influencing upon the other. Austin also introduced the notion of 'reaction with the environment', leading to another concept, that of 'change of system', typified by the use of such words as 'growth', 'development', 'disintegration', and so on. So far, the following set of relations has been distinguished:

1. Properties of systems
2. Second system/Environment related to (3)
3. Activities and interactions not involving material change
4. Active subsystem
5. Passive subsystem
6. Interactions within system
7. Second system/Environment related to (8)
8. Interactions involving change of system
9. Attribute defining a sub-class (a changed entity)

Like Ranganathan's fundamental categories, and Farradane's operators, or the syntagmatic relation borrowed by J. C. Gardin from the great French linguist, F. de Saussure, these relations are valuable in the classifying process rather than in the enumeration of schedules, and in the CRG/LA publication *Classification and information control*, Austin has provided an algorithm for this application.

Since we are at the beginning of this phase of the work, and much more obviously needs to be done in practice, I can do little more than give this cursory indication of the direction our thoughts are taking. I am sure, however, that we have a profitable line to pursue. I believe, too, that these ideas have relevance to our own professional activities. Far too much research on the construction of subject indexes has been done from the point of view of the producer; far too little from the point of view of the user. It should surely be clear by now, that if librarians and information officers do not provide tools that facilitate the work of the user, he will not think much of the service. If he finds a few references, as he might well do with a KWIC index, he will probably search no further, and go away thinking that he has recalled all the relevant items; he will be deluding himself, of course, and we shall have let him down. In the computer age, it is easy to be so dazzled by the cleverness of the machine—and after all a KWIC index is a very clever thing for a computer to do—that we may forget that our prime need is to help the user find his way about his subject field, and not to spend great effort in the publication of indexes that fall short of this target. There is no point in processing a lot of rubbish just to show what a lot of rubbish we can process.

I conclude, therefore, that in the computer age there is more need than ever before for the librarian to make an intellectual contribution to the handling of information. Part of this contribution will undoubtedly take the form of machine-readable data for ready and fast access by the user; but even here, I feel sure that we ought to bend our efforts towards ensuring that the input to the machines has sufficient intellectual structure to produce output that will be a genuine guide, and will not pose further problems to the hard-pressed user. Surrounded as he is by ever-growing mountains of paper, what he needs is a reliable guide through the heaps, not merely a technique, however brilliant, for merely moving the heaps from here to there. This sort of guide is the information librarian of the future, who, not being a machine, will have a central and essential part to play in the process of transforming the masses of information produced by research into the collective wisdom of which society now stands so greatly in need.

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DISCUSSION

MR G. WHATMORE (International Publishing Corporation Ltd) commented on the importance of the intellectual contribution of the librarian to the computerized library techniques. He said that the influence of the computer should not be permitted to obscure the importance of simple and effective guides for users of information. MR FOSKETT agreed with these comments. He said that there was a real danger that the intellectual work of matching index and search languages was being reduced to computer-type mathematics, based wholly on a behaviourist (and therefore suspect) approach to professional activity. We should resist this strongly: it was one of the lessons to be drawn from integrative level theory.

MR M. WRIGHT (Institute of Criminology, Cambridge) asked if the same classification principles could be used for social sciences as natural sciences. MR FOSKETT had mentioned Derek Austin's principle 'Class at the passive system'; but a paper on, say, psychological treatment of juvenile delinquents would have more in common with another on psychological treatment of adults than with other aspects of juvenile delinquency—and to be most helpful should be classed accordingly, under the treatment rather than the person treated. MR FOSKETT said that it was likely that other principles may emerge in such fields as Philosophy and Religion, but no one had yet paid much attention to these. He did not agree with the comment on delinquents; but a flexible system, he said, should provide for both approaches.

MR R. A. FAIRTHORNE (independent) said that 'Thesaurus' was a word battered out of its sense. Originally it had meant an inverted dictionary; words being classified by their definitions, instead of definitions by alphabetically arranged words. Nowadays it was applied to any sufficiently monstrous collection of words and phrases, however organized. He went on to say that full texts and abstracts were stored in some computer systems; e.g. Salton's SMART system now at Cornell University. The basic trouble was that we did not know what to do with the text when we had got it. The gap between language and meaning was still enormous. He added a word on 'data'. This was not a property of the way in which a text was used, nor of the text itself. If one looked up fragments out of context, it was being 'data'. Many texts were used both as data and as continuous reading, e g. The Bible, and were formatted to cope with this.

MR J. E. HOLMSTROM (independent) said that a previous speaker had questioned whether a similar set of index heads could be applied to differing subject fields. Surely, he said, this depended on who the user was, or was likely to be. MR FOSKETT agreed with this and said that this underlined the need for as flexible a means for concept co-ordination as possible, both for indexing and searching.

MR T. I. BELL (Board of Trade) first of all made the point that current awareness services should not be confused with retrospective searching, i.e. KWIC and KWOC services were current awareness. Secondly, he said that examples of poor results in CIJE under various headings had been the result of poor indexing (intellectual effort), not necessarily the system. Lastly, he pointed to the need to test 'natural' language using abstracts as well as titles, in conjunction with larger computer stores. There was nothing to stop the use of thesauri and classification schemes in the intellectual effort of searching the natural language file. MR FOSKETT agreed with MR BELL's first point, but said that current awareness services very often cumulated to retrospective searching services, using the same structures. The *Culturally Disadvantaged* KWOC index was a retrospective searching tool. Secondly, poor indexing often arose from the system, however; in CIJE, the lack of rules clearly showed itself in the two different treatments of foreign material. He agreed with MR BELL's last point and said that more work was needed here. It might be that the future rôle of classification was more to structure enquiries, and match search and index languages, than simply to act as a means for arranging documents or surrogates.

MR N. ROBERTS (Sheffield University Postgraduate School of Librarianship and Information Science) asked whether it was possible that Mr Austin's search for 'fundamental drives' was a form of reductionism that he had warned us against. MR FOSKETT said that there certainly could be a danger of this. We had to remember that such drives were no more than starting points in the *social* sciences. It was the relations set up between individuals, binding them into groups, that lifted the phenomena on to the *social* level.

THE IMPACT OF MECHANIZATION ON THE BOOK WORLD

JULIAN BLACKWELL
Blackwell's, Oxford

Paper presented at a joint meeting of the Aslib Northern Branch and the Reference, Special and Information Section of the Library Association, Wednesday 3rd December 1969

WE must first stop and think whether there *will* be a future for the book world. The book has been in use for hundreds of years, as a medium for communicating information, but it is now meeting fiercer and fiercer competition. When television first became widely used, there were prophecies that the sales of books would diminish. Now we have colour television and video-tape recording. Perhaps we shall soon be able to borrow a video-tape of *Ivanhoe* or even the latest novel from the public library. The use of audio-visual aids is growing fast, particularly in schools. Language laboratories, and teaching machines sometimes coupled with computers, are on the increase. Computer installations are increasing in number and scope even faster than the experts predict. We hear of plans for data bases for vast on-line data banks. I am told that the main reason that Leasco took over Pergamon was to obtain Pergamon's journals for a data base.

Information services based mainly on non-book materials are being drastically affected by computers, for example abstracting services have been computerized including Chemical Abstracts, Science Citation Index, Excerpta Medica, Biological Abstracts, Index Medicus and subject centres are rapidly developing, such as the Consortium of Chemical Information, which includes all British societies interested in Chemistry, and which is developing the use of Chemical Abstracts information on tape. There is already competition between computerized information retrieval systems. The commercial Excerpta Medica Foundation competes with Index Medicus run by the National Library of Medicine in Washington.

Microform publication is increasing rapidly. This has been common for some years. All NASA reports are available on microfiche. Photo Chromic Micro Image—PCMI—enables more than three thousand pages to be reproduced on a four inch by six inch transparency and copies only cost a few shillings. A PCMI reader will, with its index, locate a page in seconds and reproduce it on the screen, or a reader/printer will make hard copies. It is suitable for reproducing long, expensive, rare or reference material and for storing ephemeral material. A complete literature search can be stored in one transparency. It overcomes all space limitations and problems and eliminates the need for librarians to do internal abstracting as the entire original can be made available to the reader. But there are problems; copyright must be considered. One PCMI reader costs about £300 and a university would need many.

Thus we see mounting competition from all sides against the book. The book itself has remained substantially the same for hundreds of years and is now facing brilliant new technical innovations on all sides. How is it standing up to this competition?

I have recently had the fortune to speak to a number of wise men in the book trade including a conference of sixteen of the leading publishers, the Managing Director of the Pergamon Press, who had spent some time in America with the President of Leasco, the new Marketing Director of the British Printing Corporation and a publisher who has invested in PCMI and who is having research done on it on his own account. They were all independently unanimous that the book was here to stay for the foreseeable future. Their opinion is shared by the Dainton Report which says that even after two or three decades the book will continue to be indispensable as a research tool and as a source of information.

In a note headed '*Hopes, Fears and Computers*', *The Bookseller* had this to say on 31st May 1969.

> Representatives of the Association of American University Presses met in Chicago last month to take a look at computer technology and what it was likely to do to university publishing. The conference had been called, delegates were told, because of the 'sense of frustration' experienced by eight university press members who attended a meeting of the National Science Foundation. Compared with university libraries and computing centres, the publishers felt sadly 'there is nothing 20th century about what we do'. From the report in *Publishers' Weekly* it appears that it was not without misgivings that the delegates heard what the paper describes as 'particularly dazzling presentations of future on-line terminals, computer-generated microforms, high speed cathode ray tube and optical character recognition devices, and of acrobatic manipulations of giant data bases in a matter of nanoseconds'. But, says the report, 'reassurances about the future of the book were plentiful'. Mr Dana Pratt, associate director of Yale University Press, rallied the publishers' ranks, saying 'Don't let them snow you with buzz words.' If the computer had preceded the book, he suggested the book could have been hailed as a technological invention—portable, durable, requiring no electricity, and, moreover, it's cuddly'.

What will be the impact of mechanization on the book? We should look quickly at book production. Paper makers now have their machines controlled by on-line computers, but paper is much the same and still keeps going up in price fairly sharply. Printing, over the last few years, has rapidly become increasingly technical. Computer type-setting is already with us on a small scale, and will certainly increase in future. But at present the efficient traditional printer is still competitive. In book binding, the new technologies are making little change. In general, the paper makers, printers and binders are introducing new methods to increase productivity and to try to absorb ever increasing costs, which nevertheless mount at a steady 5 per cent each year.

What about bookselling and publishing? William Maidment, at the Authorities session of the Public Libraries Conference, hit the nail on the head by saying, 'It is more likely that the Prices & Incomes Board will discover that neither publishers nor booksellers are making excessive profits but that there is room for improvements in marketing and distribution.' Some thirty of the leading publishers have their accounts analysed by the Centre for Interfirm Comparisons. The figures are confidential but it is no secret that the profit ratios are surprisingly low. The Charter Booksellers publish an analysis of their accounts annually for all to see. The more efficient booksellers were making a profit of 4 per cent on turnover in 1968. But now the increase of the iniquitous S.E.T. and the impact of government legislation is reducing this profit to 3 per cent or even less. University scientific and technical booksellers are only making a mere 1.1 per cent. Taxes immediately take half of any profit made and the remainder is ploughed back into the business but is inadequate for expansion and improvement. The desperate plight of booksellers has been recognized by the publishers, who are in process of giving slightly better terms of trading.

In marketing, a few years ago Penguins tried a very interesting experiment by making Richold Holme their Marketing Director. Having been brought up in the hard competitive world of Soap Marketing, he was the first real professional at marketing in the book trade. He left Penguins before the full impact of his work could be felt. He is now in charge of the publications side of the British Printing Corporation, and it will be very interesting to see what he achieves. I agree with Mr Maidment that there is room for improvement in marketing, but I do not think this will have great impact. It is in distribution where the major improvements are needed.

Mechanization can certainly teach us much on distribution. Publishers have up till now generally treated distribution lightly and have dealt with it in an amateur fashion. They have now awakened from their complacency because of increasing costs and the growing complaints from the public and from booksellers. It has been demonstrated to them that distribution is now a science and that they can be more efficient and save money at the same time. A new tide of professionalism is beginning to lap round more of the progressive publishers. The idea of having a book trade delivery service was dismissed as hopelessly uneconomic two years ago. A small working party on which I had the privilege of serving, was set up by the Publishers' Association to examine distribution. We analysed the delivery problem with the latest depot location and vehicle locating techniques. We used a computer program which effectively produces the towns and the roads of England on a computer. By using the computer we were able to find the most economic way to deliver parcels. The new Publishers and Booksellers Parcel Delivery Service operates from Book Centre's premises at Neasden on the northern edge of London in the following way. Most publishers are located within fifty miles of Neasden. They send their parcels into a central clearing point at Neasden which sorts the parcels into some ten separate areas. The parcels are then sent overnight by British Rail Freightliners to the various depots and are then distributed locally. Parcels for the North West are sent by Freightliner to Southport and from there they are distributed by van. The rapid development of the delivery service is due to the energy of Mr Winter-Goodwin, the new Managing Director of Book Centre. Soon the service will cover the whole of the United Kingdom and will not only provide fast, efficient delivery but will save the publishers one per cent on their home trade turnover, a saving of £½m. each year.

Computers have come rapidly into publishing. The reason for the increased use of computers can be seen by looking at inflation over the last ten years. The cost of buildings has increased 65 per cent, labour 80 per cent, machinery 22 per cent; but the cost of computers has decreased by 30 per cent. Computers are now used by publishers for some 85 per cent of the books we receive.

As you probably know, computers can accept input in the form of authors and titles but there are problems, particularly if the input is not absolutely correct. A computer really needs to eat standard codes, therefore every publisher using a computer has had to code his books. The British publishers led the world in having standard book numbering and in October 1969 in Stockholm the standard book number became an official international standard. The guide lines are set out in ISO/TC 46/WG1 (Secretariat-12) 12 E. The initials SBN are now obsolete and have become ISBN—International Standard Book Number. The nine digit SBN has now become a ten digit ISBN. The front group of digits are known as the group identifier. '0' will be the group identifier for the UK, USA, Canada and Australia group. '0' will have the advantage of not altering the modulus 11 check digit on the present SBN's.

David Whitaker of the British Standard Book Numbering Agency describes in *The Bookseller* how it was not without difficulty that international agreement was reached. Dr Ehlers from Germany led the opposition. He fought check digits as Calvin fought original sin, with modulus 11 heading his list of vices. The German book trade had investigated the possibility of introducing a similar system, and had decided against it. 'If', said Dr Ehlers 'we organized Germans cannot do it, how the hell can you English?' 'The delegates at the Stockholm meeting represented Austria, Belgium, France, Germany, Hungary, Italy, Japan, Netherlands, Norway, Portugal, Rumania, Sweden, United Kingdom and United States of America. The reports and recommendations of the working parties had additionally received written approval from South Africa, Canada, Russia, India, Egypt, Czechoslovakia, Poland, Australia and Switzerland.'

Computers need an ISBN, but the bookseller does not want to give it. Any bookseller knows that *The Concise Oxford Dictionary* is published by the Oxford University Press but no one can remember that the ISBN is 0 19 861107 2. As booksellers already know the publishers of most of the books that they have to order, they do not want to waste time looking up the ISBN, particularly as they will get nothing extra from the publishers for the extra work. A link is therefore needed between the bookseller and the computer to save the drudgery of coding in the titles.

There has now been a break-through in this problem owing to two factors. Real-time on computers is now with us. On these computers information is stored on discs rather like gramophone records. The discs are spinning round and information can be picked up from anywhere on the storage tracks on the discs. One IBM disc drive contains twenty-nine million characters of information and one IBM 2314 Unit has eight drives giving 232 million characters. This information is instantly available on a typewriter or a miniature television screen.

As an example of the use of this in libraries, I recently visited the IBM Research Laboratories at Hursley. They now have just brought into operation about seventy-five 2741 communication terminals, which are typewriters linked to a central computer. The various departments can store information on the computer and interrogate it from the terminals. The Information Officer gave a demonstration of the system by going to the nearest terminal and asking if the library had any books on Snobol programming. The 'conversation' on the typewriter went like this.

> 'Have you anything on Snobol?'
> 'Snobol 3 Primer.'
> 'Where is it located?'
> 'At location 189, Mr Hay borrowed it on the 10/9/69.'
> 'Have we any other books on Snobol on order?'
> 'The Snobol for programming language paperback edition, author: R. E. Griswold, published 1968 65/- 1 copy, order no. 99951-2/2, ordered from Blackwell's on 25/8/69 should have come by 25/9/69 has not come (*wait for it*) later reported not yet published.'

The library staff can interrogate the computer like this from any of the seventy-five terminals.

The Oxford University Press and Book Centre have independently worked out schemes for interrogating their files through visual display units. These are small television screens with a typewriter keyboard below them. Instead of girls coding in the name of the customer and the ISBN of the book from manual indices and then this information being punched into the computer, they can interrogate the computer through the screen. For example, a girl will be able to type the first four letters of an author's name and the first eight letters of a title, and then instantly on the screen will appear full bibliographical information about any books which meet this description. The Oxford Press are reckoning to get fourteen out of fifteen unique titles on the screen first time. If a title is not uniquely identified then the screen will show complete information about up to nine titles and the girl can choose the appropriate one. If necessary she can even 'turn the page over' on the screen and look at further titles, or even type in further information. When she accepts the title this information is immediately placed in the computer.

The second breakthrough factor is the Marc II project, which I am sure you all know stands for machine readable catalogue. This is an international project being developed in this country at the British National Bibliography by Jack Wells and Richard Coward. Whitakers are co-operating with the BNB as they wish to keep their twenty-six alphabets up to date by computer. Shortly, the information produced by Whitakers and the BNB will be available in Marc II format on magnetic tape.

Now, if we put together the visual display unit interrogation and the Whitaker/BNB information, you will see that we can have complete information about British books available real-time. If we add to this the forthcoming information which Whitakers will be publishing shortly, then it is possible to have information about all forthcoming and in-print British books. Mr Winter-Goodwin has produced this idea to provide the missing link between booksellers and publishers' computers. This computer would be able to accept orders from booksellers in random order, identify the ISBN of the titles, sort the orders into publishers, and provide the various publishers with machine readable input, invoices or edited standard orders. This is a very ambitious project, and I am told that it is even more advanced than the airline booking system BOADICEA. A joint publisher/bookseller working party has been set up to examine the feasibility and economics of the scheme. I have the doubtful privilege of being the Secretary of the working party, but it will certainly be a fascinating project to examine. There are many problems to be examined in detail and solved, including the most efficient method to interrogate the enormous file. At present, Book Centre are experimenting with the KWIC Index method. The problem is to put in as little information as possible and yet to pin down the title as exactly as possible. If anyone has any helpful suggestions, I am sure that Ray Cook of Book Centre would be delighted to hear of them.

One fascinating development of the 'Central Computerized Ordering' scheme is that it will be possible to have visual display units in the larger shops. If you come into Blackwell's in eighteen months time you might well find a VDU in the front shop. If you are doubtful about a title, an assistant could interrogate the central file while you watch. You could then identify the exact book and it could be ordered in London as you watch.

As so many interesting new developments were taking place in the book world, I thought it would be interesting to get together in one place for a day a few of the most forward thinking people from each part of the book world. In September, I held a conference in Oxford of two bibliographers (the BNB and Whitakers), two publishers, two distributors, two booksellers and three documentationalists. For a day we talked freely together telling each other what we were doing and planned to do in the future. So much fascinating technical information came out of the day that it will shortly be published in *The Bookseller*, and when we have digested it we shall meet again. One of the problems that emerged was that of a standard method of abbreviating book titles for use on publisher's invoices, etc. As a result of our conference, the Publishers' Association have accepted with great enthusiasm David Batty's suggestion that Aberystwyth provide a research assistant to look at this problem. One of the ideas which came up was to have some machine readable information on each book, either printed on the book or on a card. This information could be used in optical character recognition devices, possibly in bookshops and libraries. I am sure that in the future we must cut out human drudgery by making computers produce something which can be fed into the next computer with as little work as possible done by the human beings, or 'humanware' as we are becoming known!

Publishers not only use computers for distribution but also for the calculation and payment of royalties and other internal processes. One of the most advanced publisher's computers is at the Oxford University Press. Instead of having human beings checking the stock cards, the computer does it for them. It does not report if all is well but only if action is needed. In management nowadays this is called 'exception reporting'. A report will be produced showing the sales for the last thirteen months, the current rate of ordering, the stock and location of flat sheets, folded sheets, bound books and jackets. Then bearing in mind the current rate of ordering, the time taken for delivery from the printer or binder (allowing for different sizes of book) and the rate of stock turnover stipulated, the computer will recommend a reprinting or binding order. It will also remind the human beings if no action has been taken after a certain time. The Oxford Press have found that the computer does this job more economically and more efficiently than human beings.

What of the future? The real break-through in bookselling will be the advent of real-time stock control. At present this is not envisaged in the near future, owing to the uniquely difficult problem which faces booksellers. Even Blackwell's, as I suppose the equal largest bookshop in England with Foyle's, cannot contemplate this. Not only are we faced with providing a file of 250,000 books in print in England alone, let alone countless titles in the rest of the world, but some 100,000 books kept intentionally in stock and only 3½ of each of them. It may be that Book Centre can develop packaged programmes for stock control for booksellers. The rate of advance of computers is so fast, even faster than the experts predict, so I have no doubt that it will come before long. My ambition is to be able to provide our customers with the following kind of service.

Imagine a customer ringing up Blackwell's and being connected with a girl sitting in front of a visual display unit. The conversation might go something like this.

> 'Good morning, Blackwell's'.
> 'Oh, good morning, have you got that new book on Whizz-bang Programming?'

The girl types 'Whizz-bang' into her screen and then says,

> 'I think you have in mind *Grymsdke: Instant Whizz-bang Programming*, published in June 1973 by the Cambridge University Press.'
> 'Yes, that's the one. Will you please send me a copy.'
> 'We have the hard back edition in stock at £5.25 or we could order the Student's plastic back edition at £1.30. The Cambridge Press delivery time is now running at three days. Which would you prefer?'
> 'Oh, send me the one you have in stock. This is the British Cybernetics Company Library.'

The girl quickly interrogates her screen.

> 'That will be British Cybernetics Ltd, Upper Hill Trading Estate, Newtown-on-the-Ouse, parcels to be addressed for the attention of the Chief Documentalist.'
> 'That's correct.'
> 'Thank you for your order sir, the book will be sent today.'

The customer rings off, the girl pushes a button, out comes the invoice in the technical department, and off goes the book that day.

Looking into the future is bound to be controversial, but the world is changing so fast nowadays we must keep at least one eye to it. If you think that anything I have said is a load of old British rubbish, please say so, for it is only by discussion that we can look most clearly into our crystal ball.

CURRENT AWARENESS LIST

Recent additions to the Aslib library catalogue are broken down into twelve broad groups, whose coverage is indicated below. These groups are not mutually exclusive but it is hoped that users will find them helpful in scanning for new items of interest.

Note:—These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory.

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres; management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

ELIZABETH MACK
Head of Library and
Information Services

CURRENT AWARENESS LIST

Items are available in the Aslib Library and may be borrowed unless marked to indicate reference copies.*

Communication and Knowledge

KOCH, W. H.
An age of change.
Physics Today, vol.23, no.1, January 1970, p.27–32.
Change in the definition of physics and its future development, including a section on information.

WEBB, E. C.
Communication in biochemistry.
Nature, vol.225, 10th January 1970, p. 132–5.
Discussion of current information retrieval and suggestions for future solutions to the information explosion question.

MCCARN, DAVIS B.
The Biomedical Communication Network.
Bulletin of the Medical Library Association, vol 57, no.4, October 1969, p.323–8.
Presented at the 67th Annual Meeting of the Medical Library Association, Denver, Colorado, 13th June 1968. The National Library of Medicine established the BCN to provide improved information, document and education services to the community.

MEYER, THOMAS C.
Communications—a supplement to Medical Library Service.
Bulletin of the Medical Library Association, vol.57, no.4, October 1969, p.338–42.
Presented at the 67th Annual Meeting of the Medical Library Association, Denver, Colorado, 13th June 1968. The University of Wisconsin Medical Center and University Extension established a Medical Communications Center in September 1967.

Information Processing Systems

HARDING, PETER
Second Cranfield international conference on information storage and retrieval.
Program, vol.4, no.1, January 1970, p.42–50.
A summary of the papers given at the conference on the development and costs of computerized information storage and retrieval systems.

SECRETANT, M.
Gestion fédérative d'un système d'information étendu à plusieurs societes d'un groupe industriel: cooperation des utilisateurs.
A.R.N.T. Information et Documentation, no.1, May 1969, p.51–7.
Set up of the management information system of Pont-à-Mousson where users select and index the material.

DAVID, ANTOINETTE, *and* JARRAULT
Intérêt et utilité du sélecteur photoélectrique pour un centre de documentation: cas de l'INSEAD.
A.N.R.T. Information et Documentation, no.3, September 1969, p.19–21.
Since January 1968 the card index has been replaced by a photoelectric selector which allows automatic information searches.

COMPUTERIZED retrieval of organic structures
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ICI and Canadian Industries have established a computerized retrieval system known as CROSSBOW (Computerized Retrieval of Organic Structures Based on Wiswesser).

MEYER, HELMUT
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Informatik, vol.16, no.5, 1969, p.34–47.
Computer Robotron 300—and its usage and programme in the institute for data evaluation in Dresden.

Language and Indexing

LOENING, K. L., *and others*
Indexing of polymers in *Chemical Abstracts*.
Journal of Chemical Documentation, vol.9, no.4, November 1969, p.248–51.

DAVIS, CHARLES H.
An approach to automated vocabulary control in indexes of organic compounds, II.
Journal of Chemical Documentation, vol.9, no.4, November 1969, p.252–6.
The feasibility of using an authority list and an appropriate computer program to reduce scatter of index terms.

RIEMER, G.
Die Erarbeitung einer Technologie fur die Herstellung eines Permutierten Registers als Aufgabe eines Wissenschaftsorganisators.
Mitteilungen der Zentralen Leitstelle fur Medizinische Information, vol.3, no.5, 1969, p.112–8.
Production of a permuterm index for a scientific organization.

KOCH, M. S.
The role of 'verbalized concepts' in subject analysis.
Sci-Tech News, vol.23, no.4, Winter 1969, p.101–3.
Discussion of the choice of single- or multi-word terms in indexing.

WOODS, WILLIAM
Procedure for cross-indexing a new subject heading.
Illinois Libraries, vol.51, no.9, November 1969, p.842–5.

CARLEY, A. B.
Information indexing.
Consulting Engineer (London), vol.33, no.11, November 1969, p.52.

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PREPARATION of a new edition of the Bliss Classification: copy of notes distributed at A.G.M., October 1969.
Bliss Classification Bulletin, vol.4, no.3, December 1969, p.7–20.

BOSE, H.
Special auxiliaries: a critical appraisal.
Indian Librarian, vol.24, no.2, September 1969, p.59–67.
The problems associated with the application of special auxiliaries in the context of instructions contained in the introduction to UDC schedules have been analyzed and possible remedies suggested.

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Die neuen Regeln fur die alphabetische Katalogisierung: Bericht uber den Stand ihrer Bearbeitung.
Zeitschrift für Bibliothekswesen und Bibliographie, vol.16, no.5/6, 1969, p.374–80.
Given at the annual meeting of the Verein Deutscher Bibliothekare, Kiel, 1969.
Progress report on the new rules for alphabetical cataloguing.

KRIKELAS, JAMES
Subject searches using two catalogs: a comparative evaluation.
College & Research Libraries, vol.30, no.6, November 1969, p.506–17.
An experiment which found that a subject catalogue did not materially assist undergraduates accustomed to a dictionary catalogue.

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Automation fundamentals for special libraries.
Drexel Library Quarterly, vol.5, no.4, October 1969, p.192–253.
Selected papers from a workshop sponsored by the Drexel Institute of Technology Graduate School of Library Science, Philadelphia, 2nd-4th November 1967.

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L'ordinateur dans le monde des bibliothèques: quelques réflexions sur le sujet.
Bulletin des Bibliothèques de France, vol.14, no.9–10, September/October 1969, p. 377–88.
The effects of the computer on librarianship in the light of experiences in American and Canadian libraries, especially at the Laval University where the author is director of a library automation research centre.

EYRE, JOHN J.
Structure and handling of MARC files for the AMCOS update program.
Program, vol.4, no.1, January 1970, p.30–41.
Stage 2 of the AMCOS programme involved the secondment of a teacher of librarianship to the library at AWRE Aldermaston to take part in the development of computer programs.

MALIK, REX
Who owns software? The chaos continues.
New Scientist, vol.44, 20th November 1969, p.406.
How can writers of computer programs prevent exploitation of their work by others?

Subject Organization

GAUNTLETT, M. D.
The search for information.
Journal of Photographic Science, vol.17, no.5, 1969, p.170–3.
Outlines techniques of literature search. Includes a select list of publications in the field of photographic science.

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Information sources for electrical and electronics engineers.
IEEE Transactions on Engineering Writing and Speech, vol.EWS–12, no.3, October 1969, p.71–78.
Information sources found by examining periodicals, books, conferences etc. cited in 1965 IEEE publications.

HEIDEMANN, ERWIN
Zentralbibliotehk [sic] der Wirtschaftswissenschaften.
Zeitschrift für Bibliothekswesen und Bibliographie, vol.16, no.5/6, 1969, p.341–49.
Given at the annual meeting of the Verein Deutscher Bibliothekare, Kiel, 1969.
The Library of the Institut fur Weltwirtschaft, Kiel, and its role in library cooperation.

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The economics of concurrent microfiche editions of published periodicals.
NRCd Bulletin, vol.3, no.1, Winter 1969/70, p.5–6.

The use of microfiche as a current publishing medium by the I.E.E.

PHILLIPS, A. E.
Microfilm methods.
Management in Action, vol.1, no.4, January 1970, p.32–6.

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NRCd Bulletin, vol.3, no.1, Winter 1969/70, p.7–8.
Techniques based on eight years' experience in preparing drawings suitable for microfilming.

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Practical aspects of engineering drawing microreproduction systems.
NRCd Bulletin, vol.3, no.1, Winter 1969/70, p.9–12.
Basic requirements of engineering drawings reproduction systems; points to be covered in draughting standards; two systems for dealing with sub-standard drawings.

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Mikrofilm als Mittel der Rationalisierung.
Reprographie, vol.9, no.12, December 1969, p.335–9.
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Electrostatic copying equipment—questions explained.
Office Machine Guide, no 85, December 1969, p.13–17.

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A world without people: using the personal pronoun to improve technical writing.
IEEE Transactions on Engineering Writing and Speech, vol.EWS–12, no.3, October 1969, p.79–82.

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New Society, vol.15. no.380, 8th January 1970, p.45–46.
An account of the problems of Great Britain's publishers.

MACRAE, DUNCAN
Growth and decay curves in scientific citations.
American Sociological Review, vol.34, no.5, October 1969, p.631–5.
The effects of growth of the literature and of selection favoring recent articles can be separated by using an exponential model. Its application suggests that citations in sociology tend to refer to older articles than those in the natural sciences.

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International copyright: the latest.
The Author, vol.80, no.6, Winter 1969, p.151–4.

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MAIDMENT, W. R.
Technical processes in the 'sixties.
Library World, vol.71, December 1969, p.184–7.

SHARR, F. A.
The logistics of book supply.
Journal of Librarianship, vol.2, no.1, January 1970, p.1–13.
An analysis of the procedures involved in financial estimation, processing and allocation of books by the Library Board of Western Australia.

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BARKEY, PATRICK
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Library Journal, vol.94, no.21, 1st December 1969, p.4358–9.
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MINTZ, HAROLD K.
A neglected form of technical communication—the new product release.
IEEE Transactions on Engineering Writing and Speech, vol.EWS–12, no.3, October 1969, p.69–70.
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BYRNE, FRANK
Theses as a source of documentation in Ireland.
An Leabharlann, vol.27, no.4, December 1969, p. 126–131.

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LANGLEY, GEOFF
A reference service for the seventies.
Assistant Librarian, vol.63, no.1, January 1970, p.5,6,8,10.
A description of a proposed national information service.

WILDER, DAVID
A look at the library of the future.
Canadian Library, vol. 26. no.6, November-December 1969, p.440–5.
The next thirty years will see libraries linked into meaningful systems and networks, as knowledge can no longer be controlled by conventional methods.

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A statistical report on the 52 new library buildings reported for four-year colleges and universities.

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Library Journal, vol.94, no.21, 1st December 1969, p.4397–405.
Building and layout details of 6 US academic libraries.

WEBER, DAVID C.
A contribution toward planning university library buildings.
Library Trends, vol.18, no.2, October 1969, p.107–16.
A review of previous literature in the field.

STEVENS, NORMAN D.
Three early academic library surveys.
College & Research Libraries, vol.30, no.6, November 1969, p.498–505.
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Libraries for industry in Auckland.
New Zealand Libraries, vol.32, no.4, August 1969, p.126–32.
The Library of Auckland Industrial Development Division has compiled card index of the periodical holdings of industrial firms in Auckland for inter library loan purposes.

KLOTZBÜCHER, ALOIS
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Based on a paper presented by T. Mark Hodges at the 67th Annual Meeting of the Medical Library Association, Denver, Colorado, 13th June 1968. The New England Regional Medical Library Service.

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The information scientist.
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KUNZE, H.
The training of librarians and documentalists in the German Democratic Republic.
Journal of Librarianship, vol.2, no.1, January 1970, p.43–55.

WIGHT, EDWARD A.
Conference on library research: review article.
Library Quarterly, vol.39, no.4, October 1969, p.359–63.
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MEDICAL TRANSLATIONS. S. M. Bonnekamp, FIL, Member of the Translators' Guild (Med., Science & Lit.), 47 Firs Close, Muswell Hill, London N10. Tel. 01-883 3962 during office hours. After office hours automatic telephone answering machine will record messages.

TECHNICAL SWEDISH, DANISH, NORWEGIAN translated by J. T. Craddock, B COM, FIL, Ekard. Ray Park Avenue, Maidenhead, Berks. Maidenhead 24931.

RUSSIAN/ENGLISH TRANSLATIONS. Chemistry, electronics, mechanical engineering. Twenty years' experience Government Department. A. de Merindol, 19 Ingelow House, Kensington, W8. 01-937 6788.

JAPANESE/ENGLISH, RUSSIAN/ENGLISH translations. Chemistry, medicine, biology, zoology. D. A. Fraser, BA, MIL, 22 Gresley Road, London N19. Tel.: 01-272 5664.

WILFRED E. GOODAY, ARSM, DIC, C.ENG, MIMM, FIL. Member of Translators' Guild, Romanian and French. 161 Rivermead Court, London SW6. RENown 2912.

MEDICAL, PHARMACEUTICAL, BIOLOGICAL translations from French, Romanian and Portuguese into English and from English into French and Romanian. Dr. J. Jacobson, 94 Temple Fortune Lane, NW11. 01-455 1010.

TECHNICAL TRANSLATIONS from Russian, German and Polish into English. B. Klipstein, B SC(HONS), 1 Glenview Grove, Shipley, Yorkshire. Tel. Shipley 58215.

TECHNICAL AND COMMERCIAL translations from English into Russian. Mrs O. Linsley, 31 Parke Road, Barnes, London SW13. Tel. 01-748 8822.

TECHNICAL TRANSLATIONS from Japanese into English. R. A. Scutt, BA, 48 Somerset Avenue, West Wimbledon, London SW20. Tel. WIMbledon 1713 (01-946 1713).

RUSSIAN TO ENGLISH TRANSLATIONS. Physical sciences, all industries. Fast service. Ceramics and high temperatures specialities. Kenneth Shaw, c/o CIS Ltd, Churston End, Copythorne Road, Brixham, Devon. Tel. Brixham 3221.

TRANSLATIONS: TECHNICAL, SCIENTIFIC, all west-European languages. J. Smuts, B SC (ENGINEERING), FIL, 12 Thorndene Avenue, London N11. Tel. 01-360 7723.

TECHNICAL OR COMMERCIAL translations into/from English, German, Dutch and French. A. M. H. Speller, FIL, NGV, 6 Lakeside, West Ealing, London W13. Tel. 01-998 1045.

TECHNICAL TRANSLATIONS in all west European languages. Electronics and other special fields. Camera copy, printing. Peter Suchodolski, FIL (ENG), 70 Greenfield Gardens, London NW2. Tel. 01-458 2239.

AUTHORITATIVE TECHNICAL TRANSLATIONS. Spanish, French, Italian, German, Portuguese, camera copy or printed. E. W. Sykes, FIL, 39 West Close, Wembley, Middlesex, HA9 9PJ. Tel. 01-904 4273.

Appointments vacant

LIBRARY ASSISTANT required to work under supervision of Chief Librarian for large building and civil engineering contractors' scientific and technical services department. Good starting salary depending on qualifications and experience. Three weeks' annual holiday; contributory pension fund with free life assurance benefit.

Applications in writing to: The Manager (A), Central Laboratory, George Wimpey & Co., Limited, Beaconsfield Road, Springfield Road, Hayes, Middlesex.

INFORMATION SCIENTIST

A vacancy arises at the Epsom Research Division of BP Chemicals Limited in the Technical Information Section.

The Section provides information from chemical literature to the Epsom Division and patent information to the whole of BP Chemicals Limited. Material is received from various commercial information services and use is made of several computer-based documentation systems.

Duties will include document selection for current awareness services, liaison with research workers, abstracting, coding, searching and report writing. There will also be opportunities for research and development work on new information systems.

Applications are invited from men and women graduates in chemistry who have qualificatons in Information Science and are familiar with the latest techniques in this field. There is no age limit for this post, though it is likely to be most suitable for candidates not over 35.

A non-contributory pension scheme is in operation and assistance with removal expenses will be given.

Please write briefly, quoting Ref. No. 9/108/AP and giving concise details of qualifications, experience, positions held, age and present salary, to: **Personnel Officer, BP Chemicals Limited, Research and Development Department, Epsom Division, Great Burgh, Epsom, Surrey.**

BP chemicals

MEDICAL LITERATURE ANALYSIS AND RETRIEVAL SYSTEM

Applications are invited for an appointment for one, or up to two years, as a MEDLARS liaison officer, based in the Royal Society of Medicine Library. The officer will, after initial training at the National Lending Library for Science, demonstrate the system and make its facilities available at appropriate centres in London and the South-East.

Applicants should be graduates, preferably in Life-sciences, or qualified in library/information work. Salary according to qualification in range £1,300—£2,000 p.a. Applications, with the names of two references, to:—

Librarian,
Royal Society of Medicine,
1 Wimpole Street,
London, W1M 8AE.

CENTRE FOR ADVANCED STUDY IN THE DEVELOPMENTAL SCIENCES

Applications are invited for the post of

LIBRARIAN and INFORMATION OFFICER

The Centre is being established by the Developmental Sciences Trust (Chairman, Lord Adrian). Located near Oxford, it is due to open in September 1970 as an international centre for promoting research and the dissemination of knowledge about human behaviour and the influences that shape its development. It will operate by means of study groups and training courses, and will provide facilities for scientists on sabbatical leave. Basic features will be a specialist library in the Developmental Sciences, an information service, and the Centre's own publications.

The successful candidate will be responsible for establishing and running the Library and its related services. Multilingual ability will be advantageous. The salary will depend on qualifications (professional in librarianship and academic in biological, psychological or social sciences), experience and personal qualities. The salary scale will range from £2,500 to £3,500 per annum. The appointment will commence in May/June 1970.

Please write, enclosing full curriculum vitae, to

The Director, The Developmental Sciences Trust,
310 Edgware Road, London, W.2.

C I B A

SCIENTIFIC EDITOR

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John Martyn, Research Department, Aslib.
Geoffrey Ford, University of Bristol Library.
Philip Jones, Library, UKAEA, Harwell.
Anthony Foskett, Department of Information Retrieval Studies, College of Librarianship, Wales.

Enquiries to P. D. Gratton, D.P.A., F.L.A., County Library, County Offices, Matlock, Derbyshire, DE4 3AG.

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Papers given at a Symposium held at Nottingham University in March 1969, arranged by Aslib in collaboration with the Ministry of Technology and the Research Associations.

Ten papers are reproduced here (one in summary form) on the subject of the transfer or communication of information and its role in speeding up technological change. General aspects of the transfer process are considered in some detail and in relation to practical situations in industry and research. In particular serious attention is paid to the present and future role of the information specialist as an information transfer agent playing an active part —as an information 'entrepreneur'—rather than a passive one in the general process of technological innovation. *35s net (30s to members)*

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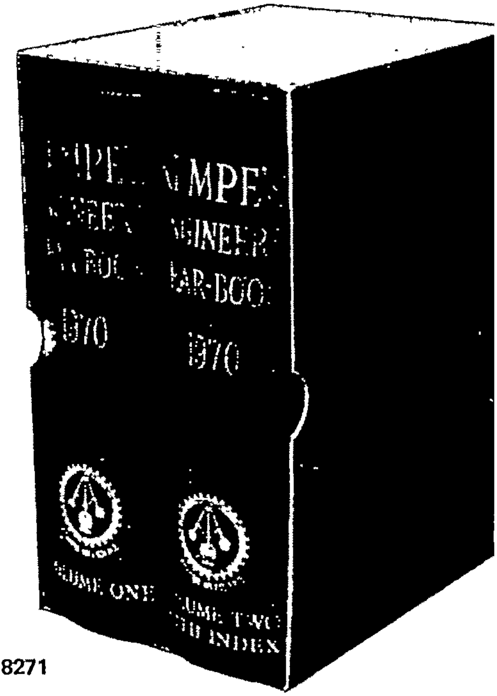

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Margaret Nicholson, the editor of **People in Books**, was formerly Head Librarian of Evanston (Illinois) Township High School.

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Written for librarians, not artists, this book deals with all aspects of library displays—signs, posters, bulletin boards, and complete exhibits. Chapters are devoted to function and types of displays, sources of display ideas, short cuts for adaptable design backgrounds, multipurpose cartoons and captions, and some fast, easy types of lettering. Design elements—color, line, shape, and texture—and rules of design—simplicity. emphasis, unity, and balance—are explained in basic, easy-to-understand language. Over 100 photographs illustrate display components and details.

Mona Garvey holds an M.S.L.S. from Atlanta University. She spent five years in France directing an arts and crafts shop.

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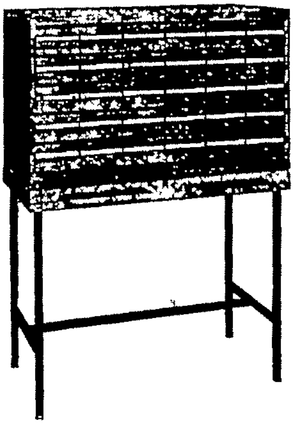

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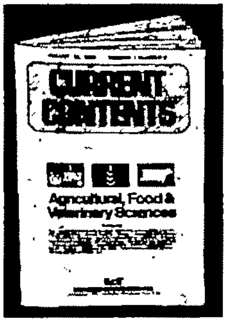

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ASLIB CALENDAR 1970

May

THU.7.	Aslib Northern Branch Annual General Meeting. Bisra, Sheffield. 2 p.m.
THU.7–FRI.8.	Aslib Audio-Visual Group Workshop. Aslib.
THU.14.	Aslib Engineering Group Annual General Meeting, Sherry Party and Lecture: 'Metrication in the engineering industry', by J. M. Kingsland (BSI). Aslib. 4 p.m.
FRI.15.	Aslib Technical Translation Group Meeting and Lecture: 'Planning a course for translators and interpreters', by H. Prais, Aslib. 3 p.m.
TUE.19–WED.20.	Aslib Open Days. 3–6 p.m.

June

TUE.2.	Aslib Open Day. 3–6 p.m.
WED.3.	Aslib Annual General Meeting. 11.15 a.m. Open Day. 3–6 p.m.
FRI.5.	Aslib Technical Translation Group. French sentence competition. Aslib. 3 p.m.
WED.10.	One Day Conference on International Developments in Scientific Information Services. Royal Society, London.
FRI.12–SUN.14.	Aslib Electronics Group Annual General Meeting and Conference. Overcliff Hotel, Westcliff-on-Sea.
TUE.30.	Aslib Co-ordinate Indexing Group. One day symposium. Engineering and Building Centre, Birmingham. 10 a.m.

September

MON.21–WED.23.	Aslib 44th Annual Conference, University of Aberdeen.

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Comision Mixta de Coordinacion Estadistica (*Econ*)	Barcelona, Spain	I. Canals
European Space Research and Technology Centre (*Aero, Eltron, TTG*)	Noordwijk, Netherlands	A. Doyle
Institute for Operational Research	Coventry	Mrs B. Hornby
Instituto do Pesquisas Radioativas (*Chem, Eltron, Eng*)	Belo Horizonte, Brazil	Miss R. M. Cunha
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National Documentation Centre for Physical Education, Sport and Recreation (*Bio, Eng, Aud-Vis, TTG, SSG*)	Belfast	G. A. Bell
Nature Conservancy (*Bio*)	London	Miss S. M. Penny
Northwestern University—Department of Industrial Engineering	Illinois, USA	Miss E. A. Moore
Richmond College of Further Education	Sheffield	Miss M. G. G. Gregory
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Statens Institut for Hantverk och Industri	Stockholm, Sweden	P. H. Rasmussen
University of Stirling (*Bio, Chem, Econ*)	Scotland	J. Stirling

INDIVIDUALS

Mme Monique Asquiedge	Boulogne, France
Miss J. Fitzpayne (*SSG*)	Manchester
E. B. Kirtley (*SSG*)	Sheffield

International Developments in Scientific Information Services

With the co-operation of the Chemical Society, the Institute of Physics and the Physical Society, the Institution of Electrical Engineers, the Library Association and the National Computer Centre, Aslib is going ahead with arrangements for the one-day conference to be held in the Wellcome Lecture Theatre of the Royal Society, London, on Wednesday 10th June. An advance programme was published at the end of March and copies can be obtained from the Conference Organizer, Aslib, 3 Belgrave Square, London SW1, to whom application to attend should be made before 31st May.

In five papers speakers will describe how the international communications network is developing—the techniques employed, the plans and achievements of the principal organizations concerned, the gaps to be filled and the present and future of the British contribution.

OECD regards governmental responsibility for scientific and technical information as part of its science policy, while its concern is widening to include communication of research and development results to policy makers in a variety of fields as well as to scientists and engineers. Peter Judge of the organization's Directorate for Scientific Affairs will give examples of 'national focuses' for scientific and technical information and of the kind of intercommunication that is developing between these focuses and between information systems in the private sector.

From The Hague, Dr F. A. Sviridov, Secretary General of the International Federation for Documentation, will talk about international co-operation among information scientists and the work of FID.

Subject and mission-orientated schemes will be the subject of Dr J. W. Barrett, Director of Research and Development, Monsanto Chemicals, who will look at the international pattern as indicated by CAS, INSPEC, INIS and others and underline the importance of compatibility between the basic systems, particularly in the context of their use in organizing broader services.

UNISIST is an answer to the challenge of the feasibility of a world system. J. R. Smith, Chairman of the UNISIST Advisory Panel, will talk about the part which the United Nations might take in promoting a worldwide system of information, both scientific and technical. Finally, Lord Ritchie-Calder will look at information in developing countries and their need for education, training and advice.

O and M Study of Aslib

In common with many other organizations, Aslib has for some time recognized the desirability of an independent and objective study of its headquarters organization and procedures, both to ensure the most efficient operation possible and also to see to it that members' subscriptions are spent with maximum benefit to the membership as a whole. It has recently become possible to give effect to this wish and Messrs S. J. Patmore and Partners were appointed by the Council to undertake the study which began during February.

Aslib Earth Sciences Group

It has been suggested that the commencement of European Conservation Year might be an appropriate time to consider the formation of an Earth Sciences Group within Aslib. Apart from the basic disciplines of geophysics, geology, and geography, the role of the earth sciences is becoming increasingly important in oceanographical engineering, exploitation of natural gas and petroleum deposits, pollution of the biosphere, agricultural development, species and land conservation, soil mechanics and water supply. Two other broadly based areas of research, closely linked to the earth sciences, are regional and economic planning and the development of natural parks and large-scale amenity areas.

Librarians and information officers have an increasingly important part to play in improving the flow of information in inter-disciplinary fields of this kind and members of Aslib who are interested should write to the Assistant Director (Services), indicating which particular field of activity they represent.

FID Study Committees

As the British National Member of the International Federation for Documentation in The Hague, Aslib has the responsibility of appointing the British representatives to the Federation's study committees. The list of British representatives has recently had to be reviewed because of changes of employment, emigration and so on, and the following persons have now agreed to serve on the committees shown:

FID/CCC	(UDC Development Policy)	BSI responsibility
FID/DC	(Developing Countries)	Mr F. M. Gardner, Borough Librarian, Central Library, Bridge St, Luton, Beds.
FID/RI	(Research on Theoretical Basis of Information)	Mr B. C. Brookes, School of Librarianship & Archives, University College, London WC1.
FID/TM	(Theory of Machine Techniques and Systems)	Dr M. F. Lynch, Postgraduate School of Librarianship, The University, Sheffield 10.
FID/OM	(Operating Machine Systems)	Mr H. F. Dammers, Shell Research Ltd, Woodstock Agricultural Research Centre, Sittingbourne, Kent.
FID/LD	(Linguistics in Documentation)	Mrs K. Needham, Cambridge Language Research Unit, 20 Millington Road, Cambridge.
FID/II	(Information for Industry)	Miss D. Dawson, RAPRA, Shawbury, Shrewsbury
FID/TD	(Training of Documentalists)	Mr H. Schur, Postgraduate School of Librarianship, The University, Sheffield 10.
FID/CR	(Classification Research)	Mr D. J. Foskett, Institute of Education, University of London, London WC1.

Technical Information for Engineers

The proceedings of the one-day conference on 'Technical information for engineers: what they need and what they get', arranged by the Council of Engineering Institutions and Aslib and held on 10th October 1968, has recently been published by the Institution of Mechanical Engineers, the organizers of the conference. The contents include the opening address given by Sir Leonard Drucquer, Chairman of the CEI, and accounts of the three sessions held.

At the first session an introductory paper (a synopsis of which is given in the proceedings) was presented by Mr C. W. Hanson, formerly Head of Research at Aslib, on the available machinery for tracking down information, with particular reference to the engineering field. Then five speakers, Mr A. W. Nash, Mr F. Liebesny, Mr E. J. MacAdam, Mr J. S. Rippon and Mr V. C. Watts, gave accounts of how certain enquiries were answered by information experts. In the second session Mr B. T. Turner, Dr J. H. Chesters and Dr D. S. Oliver spoke on 'Engineers' needs for information'; and Mr E. P. Peregrine discussed 'Engineers' needs for information retrieval'. General discussion, also published in the proceedings, followed both sessions. Finally Sir Frederick Warner summed up and formally closed the conference.

Also included in the publication are a list of delegates and indexes to the participants and to the subjects discussed. It is obtainable at 25*s* from the Institution of Mechanical Engineers, 1 Birdcage Walk, London SW1.

The Advisory Committee for Scientific and Technical Information

The Secretary of State for Education and Science has appointed Dr L. Rotherham, Vice-Chancellor of Bath University of Technology, as Chairman of the Advisory Committee for Scientific and Technical Information in succession to Dr F. S. Dainton, FRS, Chairman from September 1966 to December 1969, who resigned on becoming Chairman of the Council for Scientific Policy.

Dr Leonard Rotherham, CBE, DSc, FInstP, FIM, FInstF, FIEE, FRS, graduated at University College, London. His appointments have included Head of Metallurgy Department, RAE, Farnborough; Director of R & D, UKAEA Industrial Group, Risley; Member for Research, CEGB; and Head of Research, Electricity Supply Industry and Electricity Council. Among the professional bodies of which he has been President are the Institution of Metallurgists, the Institute of Metals, and the Institute of Fuel. He was appointed Vice-Chancellor of Bath University of Technology in 1969 and was appointed a CBE in the 1970 New Year's Honours list.

The Advisory Committee for Scientific and Technical Information was set up in April 1965 to advise the Secretary of State on the conduct of, and support for, UK activities in scientific and technical information over the whole field of the natural and social sciences and their related technologies. In particular it tenders advice on the work of the Office for Scientific and Technical Information.

FID

35th Conference and Congress

The 35th FID Conference and International Congress on Documentation will be held this year in Buenos Aires on 14–24 September. The open Congress will be on the theme of 'Users of documentation' and topics will include: communicating information to users; training of users; and tools for users. Meetings of the FID General Assembly, Council and Study Committees, and the 10th meeting of the Regional Commission for Latin America (FID/CLA) will also be held. Further information and application forms can be obtained from the 1970 FID Congress Secretariat, Consejo Nacional de Investigaciones Científicas y Técnicas, Centro de Documentación Científica, Avda. Rivadavia 1917, Buenos Aires.

2nd Seminar on UDC and mechanized information systems

This will be the sequel to the Copenhagen Seminar held in September 1968 (see *Aslib Proceedings*, November 1968) and will be held on 1–5 June 1970 in Frankfurt am Main. The programme will include closed meetings of the FID Central Classification Committee's Subcommittee on Mechanization with representatives of the other sponsoring committees (FID/CR, FID/OM, and FID/TM); summary and review of the Copenhagen Seminar; developments since September 1968; and practical computer demonstrations. Further details from the organizing committee: c/o Mr A. F. Schmidt, Deutscher Normenausschuss, Burggrafenstrasse 4–7, Berlin.

Second Regional Documentation Congress in Latin America

This Congress was sponsored by the FID Regional Commission for Latin America (FID/CLA) and was held in Rio de Janeiro on 23–28 November 1969. Topics included: scientific information and its use; carriers of information (reprography, telecommunication, union catalogues); UDC (present state and application in mechanized filing systems); and informatics and its application in libraries.

Mr F. W. Lancaster

Mr F. W. Lancaster, FLA, has recently taken up a teaching appointment with the faculty of the Graduate School of Library Science at the Urbana-Champaign campus of the University of Illinois. Mr Lancaster was a member of the staff of Aslib from January to December 1963 whilst serving as senior research assistant on the Cranfield Research Project on indexing systems.

Before taking up this appointment at the University of Illinois, Mr Lancaster was Director of Information Retrieval Services at Westat Research Inc., of Bethesda, Maryland. He has also served for three years at the National Library of Medicine where he was successively Information Systems Specialist (designing and executing an evaluation of MEDLARS), Deputy Chief of Bibliographic Services and Special Assistant to the Associate Director.

Mr Lancaster attended the School of Librarianship at Newcastle upon Tyne and has held a number of positions in public and industrial libraries in the UK and the US. His book, *Information Retrieval Systems: Characteristics, Testing and Evaluation*, was published by Wiley in 1968. Mr Lancaster also received the award for the best *American Documentation* paper of 1969 at the annual meeting of the American Society of Information Science in October 1969. The paper, which appeared in the April 1969 issue of *American Documentation*, is entitled 'MEDLARS: report on the evaluation of its operating efficiency'.

International Federation of Library Associations (IFLA)

The 36th Conference of the IFLA is to be held this year in Moscow and Leningrad from 28th August to 7th September. The theme of the conference is to be 'Libraries as a force in education'.

The Opening Plenary Session will be held on Monday 31st August in Moscow, and speakers will include the Minister of Culture, Mme E. Furtseva, and the President of the IFLA, Herman Liebaers. 1st–3rd September will be reserved for meetings of the sections, sub-sections, committees and sub-committees. Delegates will depart for Leningrad on 5th September where the conference will continue until the 7th (details to be announced later). Various study tours and visits have been arranged in both Moscow and Leningrad.

Apart from members and associate members of the Association, the conference is open to observers if recommended by their library association, through which they must apply. Further details and registration forms are available from: IFLA Conference Office, The All-Union State Library of Foreign Literature, 1 Ulyanovskaya, Moscow, USSR.

Drug Literature Index

As announced in *Aslib Proceedings* for June 1969, the Excerpta Medica Foundation of Amsterdam instituted at the beginning of 1969 a computer service for the retrieval of drug information from published articles appearing in some three thousand of the world's biomedical and chemical journals. In order to meet the particular requirements of companies engaged in pharmaceutical research, production and marketing, Drug Information Systems of London are now co-operating with the Foundation to provide a Hard Copy Information System, the *Drug Literature Index.*

Excerpta Medica specialists examine all articles published in the world's medical and biomedical journals in which there is a significant mention of a drug, and certain basic information is abstracted and punched for computer storage. At the end of each month the abstracted information is sorted by computer and a comprehensive system of indexes is generated for the *Index*. The *Index* then provides each subscriber with a monthly volume of about four thousand progressively numbered units, each unit consisting of data extracted from a single journal article.

Drug Information Systems will also prepare monthly SDI sheets according to company specification for any item retrievable by any index, e.g. any drug specified by generic name; any group of drugs as defined by drug class; specified authors, etc. Any part of the *Index* is available on microfilm or microfiche at extra cost; and photocopies of original articles are also available from the Exerpta Medica Foundation. Further information can be obtained from Excerpta Medica at 2 Queen Anne Street, London, W1.

Aperture cards and copy cards used in microcopying systems

The latest part, now available, of the British Standard on microcopying of engineering drawings BS 4210 *35mm microcopying of engineering drawings and associated data* is Part 3: 1970 *Aperture cards and copy cards.*

This part states requirements for aperture cards, that is to say cards which are suitable for handling and sorting by data processing apparatus and which can display a microfilm frame mounted in an aperture cut in the card. The standard specifies all the necessary dimensions, and the tolerances relating to mounting of the microfilm frames. Similar requirements are provided for copy cards, i.e. cards of corresponding dimensions and carrying sensitized material by means of which the mounted cards can be duplicated.

It is available at 12*s* from the BSI Sales Branch at 101/113 Pentonville Road, London N1.

International Association of Technological University Libraries

The papers presented at the fourth IATUL triennial conference on 'Educating the library user', held at Loughborough University of Technology from 31st March to 3rd April, will be published in full, together with the discussion, in the May and August issues of *IATUL Proceedings*. Non-subscribers can obtain copies at £1 ($2.50) each from the Editor, The Library, Loughborough University of Technology, Loughborough, Leicestershire.

Seminars by Freeman Dyke, Jr

Industrial Educational International Ltd are holding seminars in May and June on 'Total Microfilming' and 'Operating an effective technical information retrieval system', to be presented by Mr Freeman H. Dyke, Jr, who will be well known to Aslib members.

The seminar on technical information retrieval systems will be held at the Excelsior Hotel (Airport), Birmingham on 21st May, at the Air Terminal Building, Manchester on 29th May, and at the Cumberland Hotel, London W1 on 3rd June. The two-day course on microfilm and its applications will be held at the Air Terminal Building (Brabazon Suite), Manchester on 27–28 May, and at the Cumberland Hotel, W1, on 1–2 June.

Further information can be obtained from Industrial Education International Ltd, 110 Strand, London WC2.

Training courses for Technical Authors

Technivision Services have developed a series of training courses for technical authors in the engineering industries, to be held during the year at their Communication Training Centre at Cheltenham.

The courses are designed to familiarize potential authors with the basic requirements and production methods of the technical information industry. In particular they will enable students to design, produce and cost a wide range of publications, from training manuals to engineering specifications and technical advertising copy. Each course, which has been developed from Technivision's own in-house training scheme, will last for four weeks and will be conducted by qualified instructors in the technical information industry.

Further details will be given on request from Communication Training Centre, Technivision Services, King's House, 125–7 Promenade, Cheltenham, GL50 INW.

'Microforum International'

Britain's first international exhibition and seminar on micro-recording and information retrieval, 'Microforum International', sponsored by the Business Equipment Trade Association, will be held at the Royal Lancaster Hotel, London W2, from 16th to 19th June 1970.

Products and systems on show will include the latest developments from several countries and will range from simple equipments for smaller applications to highly sophisticated micro-recording methods.

On 17th and 18th June, a seminar, for delegates with reservations only, will cover all aspects of microfilming technique and application. Speakers at the seminar have been selected, not from manufacturers, the organizers emphasize, but from leading experts and users who can illustrate practical applications. Subject headings to be covered include: an introduction to microforms; microfilming business records; microfilm for information distribution; can I destroy the original?—the legal and storage aspects; and microfilm and the computer.

Further details can be obtained from Mr R. D'Urban, Business Equipment Trade Association, 109 Kingsway, London WC2. Tel: 01–405 6233.

Business information retrieval

Predicasts, Inc., publishers of the *Funk and Scott Index of Corporations and Industries* and the *Funk and Scott International Index* (see also p. 137), have planned a series of seminars during 1970 for users of business information services. At these one day meetings the staff of Predicasts will discuss advanced mechanisms and techniques for creating, organizing and retrieving information and services through existing and evolving media. Topics covered at each seminar will include the problems of information utilization; document retrieval; the role of indexes in advanced information systems; sources of business information; and composite forecasting.

The seminars will be held in the following locations: New Orleans, 30 April; Detroit, 12 June; Toronto, 20 August; Boston, Mass., 16 September; Geneva, 23 September; London, 25 September; Philadelphia, 8 October. Further details can be obtained from: Predicasts, Inc., 10550 Park Lane, University Circle, Cleveland, Ohio 44106.

Institute of Information Scientists

A Scottish Branch of the Institute has been formed. The Chairman is Mr R. N. Beer of BP Chemicals Ltd, Grangemouth and the Honorary Secretary is Mrs A. B. Berrill of the Commonwealth Bureau of Animal Breeding and Genetics. Further details of Branch activities are available from Mrs Berrill at 31 Braid Avenue, Edinburgh EH10 4SR (031-447 4073).

Third International Congress on Reprography

The Institute of Reprographic Technology are planning to hold the Third International Congress on Reprography at Earl's Court, London, on 15th–19th March 1971.

An appeal for papers is currently in circulation and experts in the field of reprography are invited to submit a three hundred word synopsis of their proposed paper by 30th April 1970. The subject matter will be confined to the development of *new* reprographic products and processes and to *new* applications of existing processes. Synopses of papers (in English, French or German) should be sent to Mr David Court, Executive Secretary of the Institute of Reprographic Technology, at 9 Argyll Street, London W1V 2HA. (Tel. 01-437 1622)

BRIEF REVIEWS

AFRICAN JOURNAL OF MEDICAL SCIENCES. Vol. 1, no. 1. January 1970. Oxford and Edinburgh, Blackwell Scientific Publications, 1970. £6 per annum.

The main aims of this new medical journal are to provide a medium for international dissemination and exchange of information among medical scientists in Africa and elsewhere; to serve as a forum for publications relating to international conferences on medical science in Africa; and to promote inter-regional co-operation amongst medical scientists and institutions in Africa.

Its need is justified by the lack of adequate coverage of medical scientific literature in Africa and by the considerable attention paid in recent years to medical problems in Africa. This has arisen largely from an awareness of new diseases peculiar to the African continent but which have universal implications.

The journal is edited at the University College Hospital of Ibadan, Nigeria, and is published quarterly. The first issue contains eight articles (including one in French) submitted mainly by staff at the University of Ibadan and includes studies in such fields as immunopathology, respiratory physiology, clinical endocrinology and cancer epidemiology. It is hoped that the journal will receive full support from medical scientists in Africa and that papers from all parts of the continent will be submitted to the editor.

HARVEY, JOAN M. Statistics—Africa: sources for market research. Beckenham (Kent), CBD Research, 1970. 175 p. £4. (SBN 900246 05 7).

The purpose of this publication is to provide a guide to published statistics and the availability of unpublished statistics for the whole of the African continent and adjacent islands. The first section of the book provides information on statistical sources that include Africa in general or several individual countries.

The main section of the volume is arranged alphabetically by country. The details given for each one include name and address of the Central Statistical Office and other important organizations that provide statistics and some information on their work and facilities; the principal libraries where collections of statistical materials can be consulted; sometimes the address of libraries and information services in other countries where the statistics are available; principal bibliographies of statistics, and major statistical publications. This last section is arranged in standard groups: general, production, external trade, internal distribution, population and standard of living.

There are indexes to the titles of publications included and to organizations. This is a most useful companion volume to *Statistics—Europe*, also published by CBD Ltd.

KUJOTH, JEAN SPEALMAN, *comp.* Libraries, readers and book selection. Metuchen (NJ), Scarecrow Press, 1969. 457 p. $10. (SBN 8108 0265 1).

This is a collection of forty-four periodical articles reprinted from twenty-eight, mainly American, journals. There is a degree of American bias but the information has a general application. It is intended both for students and practising librarians, and covers the varied set of evaluative decisions required for maximum efficiency in book selection for general and specific groups of readers. The articles are arranged with these headings: professional reading; reading interests and needs of special groups; communication and reading values; the Public Library's collection; the Academic Library's collection; trends, issues and influences affecting book selection; and censorship and controversial books.

LIBRARY ASSOCIATION. Directory of Medical Libraries in the British Isles. 3rd ed. Compiled by the Medical Section of the LA. London, 1969. 128 p. 20*s*. (SBN 85365 451 4).

This is the third edition of the directory first published in 1957. Not only have the entries been brought up to date, but this edition also covers about eighty more libraries than the second edition, and is published this time in a flexible cover. However, the most important change is a fundamental one: the format has been completely revised. Whereas the main entries in the second edition were arranged alphabetically, with a brief geographical index, in the third edition they are arranged geographically, with an alphabetical index of establishments, plus an index of personal names and a subject index to specialist libraries, but no list of special collections. This revised layout should make what was already a useful source of information in the medical field even more valuable.

LIBRARY ASSOCIATION (London and Home Counties Branch). London union list of periodicals. [3rd ed.]. Edited by H. J. Rengert. London, 1969. 102 p. 2 *gns.*

This is a 'current' list of titles of periodicals, collected between April 1966 and June 1968, arranged in alphabetical order with public library locations and an indication of holdings. It is to be kept up to date by annual revisions. The information was provided by the co-operating libraries, i.e. the thirty-two London Boroughs, the City of London and the libraries of Brighton, Luton, Reading and Southend-on-Sea.

In this edition there is a considerable increase in the number of titles listed, but locations within a library system and the bibliographical details of the periodicals are no longer included. National daily newspapers, except *The Times*, local newspapers and magazines, house magazines etc. are excluded. Directories are also excluded but a number of annuals are included.

Unfortunately a number of titles are listed out of order, but the publication will still prove useful.

PERIODICALS IN MATHEMATICS in the libraries of the University of Manchester, UMIST, the University of Salford, Manchester Business School, National Computing Centre. March 1969. 9 p. Free.

Copies of this publication have recently been received by the Information Department at Aslib. The list is arranged alphabetically by periodical title and the library locations, together with their holdings, are given. Nearly two hundred titles are included.

Copies of this list are available free of charge from: J. K. Roberts Esq., Sub-Librarian, UMIST, P.O. Box 88, Sackville Street, Manchester 1.

10-JAHRES Ergänzung zu den DK-Kurzausgaben. 10-year supplement to abridged UDC editions, 1958–1968. The Hague: FID; Paris: Unesco, 1969. 176 p. (FID 442; Unesco A 2520).

This trilingual supplement (English/French/German) updates abridged editions of the UDC, and in particular the *Trilingual Abridged Edition* of 1958 (FID 277). The condensed index lists the more important new subjects and a detailed table of contents indicates the areas where changes have been made or new sections introduced.

DIRECTORY OF SHORT COURSES IN LIBRARIANSHIP AND INFORMATION WORK, 1970

* courses which are tentative
ND = not yet decided
LAA = courses approved by Library Association for Mature Registration Scheme

Dates	*Subject*	*Total no. of days*	*Location and cost*	*For whom intended*	*Organization and Collaborators*	*Inquiries to*
Apr. 28	'Effective communication in management'	1	Hyde Park Hotel London. £21	Managers	IEI Ltd	Industrial Education International Ltd, 110 Strand, WC2
Apr. 28–30 *LAA*	Course on work with patents and elementary patent practice	3	London. 16 *gns* members 12 *gns*	Library and information staff handling patents	Aslib	Education Officer, Aslib
Apr. 30–May 1	'Making visual presentations'	2	Hyde Park Hotel London. £45	Financial, engineering and technical managers	IEI Ltd	Industrial Education International Ltd, 110 Strand, WC2
May 5–7	Graphic arts	3	NRCd, Hatfield, Herts. £20 £15 to members	Office executives, O & M officers, librarians and information officers	National Reprographic Centre for documentation	The Secretary, NRCd, Hatfield Polytechnic, Endymion Road, Hatfield, Herts
May 11–12	Information for profit	2	PERA, Melton Mowbray, Leics. 28 *gns* members 22 *gns*	Senior management	PERA and Postgraduate School of Librarianship and Information Science, Sheffield University	Education and Training Section, PERA, Melton Mowbray, Leics
May 11–14 *LAA*	Mechanization of housekeeping routines	4	London. £24 £19 to members	Library and information staff	Aslib	Education Officer, Aslib

Dates	*Subject*	*Total no. of days*	*Location and cost*	*For whom intended*	*Organization and Collaborators*	*Inquiries to*
May 12–14	Microfilm applications	3	NRCd, Hatfield, Herts. £20 £15 to members	Office executives O & M officers, sales reps and those engaged in reprography, librarians and information officers	National Reprographic Centre for documentation	The Secretary, NRCd, Hatfield Polytechnic, Endymion Road, Hatfield, Herts
May 19	Introduction to technological literature	1	NRLSI (Holborn Division), 25 Southampton Buildings, London WC2	Industrial scientists engineers, new recruits to technical libraries and information work	National Reference Library of Science and Invention	Keeper, NRLSI, 25 Southampton Bldgs, London WC2
May 26–29	The college library and local industry	4	15 *gns* members 12 *gns*	Staff of technical and other college libraries	Aslib and Colleges of Technology and Further Education Section of the LA	Education Officer, Aslib
June 1–2	'Microfilm applications company wide'	2	Cumberland Hotel, £45	Technical librarians, management, handling and managing information	IEI Ltd	Industrial Education International Ltd, 110 Strand, WC2
June 3	'Information retrieval for engineers and scientists'	1	Cumberland Hotel, London. £21	R & D, engineering, industrial marketing and other technical staffs	IEI Ltd	Industrial Education International Ltd, 110 Strand, WC2
June 8–12	Management Course: Evaluating the library service, some modern techniques	5	Maryland Residential Centre, Woburn, Bucks. *c.* £16	Senior librarians, i.e. chief deputy or chief assistant librarians in all types of library	London & Home Counties Branch of the Library Association	R. Brown, FLA, Public Library, Marylebone Road, London NW1

June 9–11	Work with maps	3	London. £16 £13 to members	Librarians with small collections of maps	Aslib and British Cartographic Society	Education Officer, Aslib
June 16–17	New developments in management information systems		Harrogate. 50 *gns*	Senior and middle managers	University of Bradford Management Centre	Programme Secretary, Post Experience Programmes, The Management Centre, University of Bradford, Bradford 9
June 29–July 3	Indexing	5	London, North-Western Polytechnic		Society of Indexers	North-Western Polytechnic, School of Librarianship, 205–227 Essex Road, London N1
June 29–July 3	Personnel selection, management and control	4	The Queen's University of Belfast (School of Library and Information Studies). *c.* £25 including residence	Senior Librarians i.e. Chiefs, Deputies, Departmental Heads, etc, in academic and public libraries	School of Library and Information Studies, Queen's University of Belfast	Acting Director, School of Library and Information Studies, The Queen's University of Belfast, Belfast, BT7 1NN, Northern Ireland
July 4–10	Scottish Library Association summer school of librarianship	7	Newbattle Abbey College, Dalkeith, Midlothian. £15	Qualified librarians, post-graduate student librarians, and refresher course for senior staff of all types of library	Scottish Library Association	A. G. D. White, ALA, Hon. Secretary, SLA Summer School, Blackhall Library, Hillhouse Road, Edinburgh, EH4 5EG

Dates	*Subject*	*Total no. of days*	*Location and cost*	*For whom intended*	*Organization and Collaborators*	*Inquiries to*
July 19–25	Enticing children to read	7	School of Librarianship, Loughborough Technical College. £15 residential, £7 5*s* non-residential	Teachers and children's librarians	Loughborough College of Education and Loughborough Technical College	Registrar, Summer School, Loughborough College of Education, Leics.
July 21–23	Seminar on NLL	3	NLL, Boston Spa. Accommodation and subsistence cost only	Library school tutors	National Lending Library for Science and Technology	A. Myatt, National Lending Library for Science and Technology, Boston Spa, Yorks, LS23 7BQ
July 29–Aug. 6	School library management	9	Hertford, Balls Park College of Education	Secondary school teachers with little or no experience of librarianship	Department of Education and Science	Applications to LEAs on DES form 106RSC. Further details from LEAs
Aug. 30–Oct. 10	Bookselling		London and Cambridge. £185	Those professionally engaged in bookselling outside Britain	British Council	Director of Courses Department, The British Council, 2/3 Bloomsbury Square, London WC1
Sept. 5–7	Libraries and learning in the 1970s	2	Churchill College, Cambridge. *c.* £8 10*s*	Children's librarians and others	Youth Libraries Group of the LA	Miss C. J. Atrill, Nottinghamshire County Library, County Hall, West Bridgford, Nottinghamshire

Sept. 14–18	Social Science literature	5	NLL, Boston Spa. Accommodation and subsistence cost only	Technical college librarians	National Lending Library for Science and Technology	A. Myatt, National Lending Library for Science and Technology, Boston Spa, Yorkshire LS23 7BQ
Sept. 15–18	Teaching methods for librarians and information officers	4	Roehampton, Garnett College, *c.* 8 *gns*	Librarians and information officers	Aslib	Education Officer, Aslib
*Oct. 21–23	The use of the chemical literature	3	Liverpool. *ND*	Chemists, graduate and undergraduate	Liverpool Regional College of Technology, Department of Chemistry and Biology, and Liverpool Public Libraries	Dr H. D. Law, Head of the Department of Chemistry and Biology, The Regional College of Technology, Byrom Street, Liverpool L3 3AF
*Nov. 16–17	Information for profit	2	PERA, Melton Mowbray, Leics. 28 *gns* Members 22 *gns*	Senior management	PERA and Postgraduate School of Librarianship and Information Science, Sheffield University	Education and Training Section, PERA, Melton Mowbray, Leics.

COURSES WITH DATES NOT PRECISELY SPECIFIED

Dates	*Subject*	*Total no. of days*	*Location and cost*	*For whom intended*	*Organization and Collaborators*	*Inquiries to*
*Summer 1970	Use of scientific and technical literature		Portsmouth College of Technology	Technical College librarians	Portsmouth College of Technology	W. G. Gale, BA, ALA, Librarian, Portsmouth College of Technology, Hampshire Terrace, Portsmouth, Hampshire
*June 1970 *LAA*	Classification and indexing systems	4	London. £25 £21 to members	Senior people new to information work	Aslib	Education Officer, Aslib
*June 1970	Junior introductory course	4	London. £21 £15 to members	Non-graduates in first year library or information work	Aslib	Education Officer, Aslib
*June 1970 *LAA*	Mechanization without computers	3	London. £22 £17 to members	Senior staff of special libraries and information services	Aslib	Education Officer, Aslib
*June 1970	Introduction to business information	3	London. £16 £13 to members	Staff in first year of commercial information work	Aslib	Education Officer, Aslib
June 1970	Facing practical problems in special libraries	1	Ealing School of Librarianship. (provisional announcement no cost yet estimated)	Young librarians and information workers with a measure of responsibility	Ealing Technical College	Mr J. Burkett, MA, FLA, Principal Lecturer, Ealing Technical College, St Mary's Road, London W5

*June 1970 or Oct 1970	Scientific and social scientific literature	5	NLL, Boston Spa. Accommodation and subsistence cost only	Public Library staff	National Lending Library for Science and Technology	A. Myatt, National Lending Library for Science and Technology, Boston Spa, Yorks, LS23 7BQ
*July 1970 *LAA*	Systems analysis	5	London *c.* £20	Senior library and information staff	Aslib	Education Officer, Aslib
*July 1970	Use of scientific and technical literature	4	University of Aston in Birmingham *ND*	CTFE librarians	Colleges of Technology and Further Education Section of the LA, Aston University, Birmingham Library School	H. Pemberton, Library, Polytechnic, Wolverhampton
*Autumn 1970	Computer handling of chemical structural information		Sheffield *ND*	Scientists, information staff, and technical librarians	Postgraduate School of Librarianship and Information Science, The University, Sheffield	Dr M. F. Lynch, Postgraduate School of Librarianship and Information Science, The University, Western Bank, Sheffield S10 2TN
Autumn 1970	Medlars course	4	NLL, Boston Spa. Accommodation and subsistence cost only	Medical librarians and information officers	National Lending Library for Science and Technology	A. Myatt, National Lending Library for Science and Technology, Boston Spa, Yorks, LS23 7BQ

Dates	*Subject*	*Total no. of days*	*Location and cost*	*For whom intended*	*Organization and Collaborators*	*Inquiries to*
*September 1970	Historical binding			National and University Library staffs	SCONUL	Librarian, University Library, Queen Victoria Road, Newcastle upon Tyne NE1 7RU
Christmas 1970	Scientific and social scientific literature		NLL	University research workers	National Lending Library for Science and Technology	A. Myatt, National Lending Library for Science and Technology, Boston Spa, Yorks. LS23 7BQ

COMMERCIAL INFORMATION

G. P. HENDERSON

Director, CBD Research Ltd

Paper presented at a Joint Meeting of the Aslib Midlands Branch and the Institute of Information Scientists, Tuesday 13th January 1970

'COMMERCIAL information' is a large and imprecise concept, and one that is almost impossible to define. Every innovation, in fact every new condition or situation, can originate business activity and a need for information. Obviously all business enterprises need what can only be described as 'general information'; most also require scientific and technical information; commercial information fits into neither category—it is often useless to anyone not engaged in business, and it certainly cannot be described as scientific. It therefore seems that commercial information can only be described as 'special information of interest primarily to those engaged in business operations'. 'Primarily' is an important qualification—today much information formerly regarded as strictly 'commercial' is of major consequence to the private consumer and those who protect his interests.

Information needs are not necessarily correlated to sizes of business undertakings: a company mining iron ore on a large scale in Labrador or Western Australia may have few commercial information needs, whereas a small firm of stockbrokers will require a very considerable volume. A company marketing ventilation fans for chemical plant has an infinitely more complex information requirement than one selling soap-powders to the domestic consumer. Likewise there is great variety in the relative importance of commercial information to various departments according to the type of business: for a merchant bank it is central to operations, in a manufacturing company it is the essence of market research, and in other types of business the chief user will be the credit controller or chief buyer.

In this paper I have tried to outline what I personally regard as some of the most important areas of information that can be described as 'commercial'.

Commercial information can be divided into three main categories, namely:

1. Information about business enterprises other than one's own
2. Information about the environment in which the business operates
3. Information required to solve routine problems that arise in the course of business operations

I shall consider each category in turn and discuss the types of source material appropriate to each.

Information about other businesses

This can itself be subdivided into three categories: Location, Identification and Evaluation. Location queries range from the simple—'What is the address of the Midland Bank branch in Carlisle?'—to the search for a company with a name such as 'Indolex SA', which might be in almost any French, Spanish, Italian or Portuguese speaking country in the world, or the often time-consuming search for the whereabouts of a recently registered company. The majority of location queries are answered correctly and quickly by using the alphabetical sections of appropriate directories; the occasional difficult one may require resort to indexes of new companies—such as the one compiled on a co-operative basis by the major public library commercial departments from *Jordan's Daily Register of New Companies*[1], or eventually to Companies House or to a commercial enquiry service.

'Identification' embraces a wider range of problems, summed up in the two questions: 'Who can supply what we need?' and 'Who will buy what we make?' Here again countless everyday answers are supplied by the straightforward use of trade directories. But the complexity of modern technology has created the need for information sources which will provide answers in ever greater detail; the intending purchaser of a TV receiver or a pair of shoes can easily find a dozen suppliers, but the search for the manufacturer of a phthalocyanine pigment of a given specification entails the use of more sophisticated sources of information; similarly, the producer of basic needs such as sausages or saucepans can easily identify his 'outlets', but the manufacturer of special leathers for gas-meter diaphragms who wishes to identify potential buyers in a new export market has to use more elaborate sources. Hence the trend which has led to works such as *Kelly's Manufacturers Directory*[2], with over nine thousand trade headings, *Kompass UK*[3] with 25,000, and the ever-growing number of specialized directories, buyers' guides and catalogues for specific industries; to services such as *Barbour Index*[4], filling the information needs of those who specify for the building industry; and, perhaps the ultimate in supplier identification, the American *VSMF* system[5].

A facet of identification work familiar to most of us is the trade-name enquiry —'Who makes BEEHIVE hexagonal nuts?', 'Which food chain uses the brand name SAINT ALOYSIUS?' The index to the 6th edition of *Current British Directories*[6] identifies over two hundred sources in the UK, ranging from *Kompass UK Trade Names*,[7] listing over seventy thousand, to highly specialized lists such as that in the *Surface Coating Resin Index*.[8] Well established card indexes, such as the one in Birmingham Commercial Library and the *Patent Office Trade Names Index*[9] provide great reservoirs of trade-name identification potential, but there is always the problem of the unregistered brand name, the obsolete trade name on a piece of machinery requiring a replacement part, and the special trade name of a Japanese product for the East African market, to challenge the resourcefulness and ingenuity of the commercial information worker.

Finally, an aspect of identification work probably less familiar to the information worker than the foregoing, namely the identification of specific business opportunities. In almost every trade journal and every issue of the *Financial Times* appear reports of contracts being awarded, new companies being formed, new developments projected. To the active businessman each presents a specific opportunity to offer his lubricants, insurance, translation service, fork-lift trucks, &c. to a prospective purchaser who cannot fail to be impressed by his being 'on the ball'. Worth mention in this context are *Middle East Economic Digest*[10] and *Chemical Market Abstracts*[11] which regularly report new projects.

We come now to 'Evaluation', or the process of determining the status of a business, either as a customer, supplier, competitor or investment. In this field the problem is sometimes one of selecting the appropriate facts from the mass of information available, and at other times one of drawing the right conclusion from the total absence of information. In *European Companies*[12] I have tried to identify the principal live and published sources of information about UK and continental business enterprises; they include files at the official company registration offices, status and credit information services such as Dun & Bradstreet and Creditreform, financial yearbooks and investors' services, directories such as *Key British Enterprises*[13] that contain basic company data, works of the *Who Owns Whom*[14] type that identify company linkages, directories of directors, and newspapers and periodicals that contain reports of company affairs. The experienced worker can often evaluate a company fairly quickly for everyday needs by using standard published sources, but in the business climate of the 70's the most recent news can be vital; apart from the *Financial Times* and other daily and weekly journals carrying business news, there is a range of important services designed primarily for the investor and up-dated on a daily or weekly basis—*Extel Statistical Service*,[15] *Moodies British Companies Service*[16] and *Informations Internationales*[17] being among the most important for the British user; of special note also is *Research Index*,[18] which indexes, fortnightly, by subjects and by company names, reports appearing in some 150 newspapers and trade periodicals; and its American counterpart, the *Funk & Scott Index of Corporations and Industries*,[19] covering nearly one thousand sources, and *Funk & Scott International Index*.

Where evaluation is being applied to a competitor certain other factors assume major importance, particularly the assessment of his share of the market and degree of aggressiveness. This is not an easy exercise, but one of the clues is the amount he spends on advertising; and this figure, for many companies, is published in tables appearing in the *Advertisers Annual*,[20] the *Advertising Directory*[21] and, across the Atlantic, in the *Standard Directory of Advertisers*.[22] Trade catalogues and catalogues of exhibitions and fairs can also be fruitful sources of information about the activities of 'the opposition'.

Information about the environment in which a business operates

Ultimately, all businesses operate in a 'world environment', but for practical purposes each business has its own local environment with which its information needs will be commensurate; thus a village bakery would be affected by a world wheat shortage, but is more immediately concerned about the advent of a major housing development which may double its market. Study of the environment has both active and passive aspects; active being the examination of how best to exploit the existing and future environment for the purpose of selling products or services—in other words, market research; passive being the anticipation of inevitable changes in the environment which will affect the business willy-nilly—a good example being currency devaluation. All human life from conception to cremation presents business opportunities for someone: it is therefore market research which creates the widest and profoundest information needs in the business community. Much of the information applied in market research is general or technical information and therefore outside the scope of this paper; other data are collected by interview or other means for a specific market investigation and are never communicated outside the unit concerned. But almost every market investigation must include some basic 'desk research' involving the use of published information, particularly statistics; the bulk of such statistics are collected by government agencies, primarily for the purpose of running national economies; many are collected and published by international agencies such as OECD for the better economic planning of wider areas.

In her books *Statistics—Europe*[23] and *Statistics—Africa*[23], Miss Harvey has listed statistical 'sources for market research' in six main groups, and a brief consideration of these groups illustrates the breadth of statistical material which is applied in the study of a business's environment as a potential market. The groups are: (a) General statistics (Does Ruritania's rainfall pattern justify its consideration as a market for umbrellas?); (b) Production (Are there industries in Ruritania that consume tonnage quantities of argon?); (c) External trade (Is it a net importer or net exporter of my company's product?); (d) Internal distribution (Is there a growing market for cash registers, supermarket equipment, wholesale accounting systems?); (e) Population (Is there an increasing number of feet for our footwear, of housing units requiring our door furniture?); (f) Standard of living (How many families can afford freezers, encyclopaedias, stainless steel table-ware?).

Study of the business environment is not, of course, limited to statistics; many factors not usually expressed in statistical form can be vital in the assessment of a potential market or possible plant location—language, social habits, political climate, religion, even superstitions, to name but a few. Much of this type of information is embedded in the pages of the *Statesman's Yearbook*[24] and I have the impression that this admirable work is used less than it could be in the business world.

Information required to solve routine problems

Many may well regard this category as the real essence of commercial information, concerned as it is with the actual everyday operations of buying and selling, making and moving. It includes such a wide range of diverse material that it is difficult to classify, in the context of this paper, except under broad headings such as transportation, law, taxation. A point to observe is that in most organizations of any size in which questions such as 'What special regulations apply to parcels posted to Sweden?' or 'How to claim SET refunds?' may arise, there will be a staff-member with special knowledge and responsibilities dealing with such matters; but he may not know the sources to use when an unfamiliar example occurs, and it is important that the information department should be ready to help. Each unit will have its own range of problems; here are a few examples of the types of questions that can arise and some of the sources available:

What are the US customs regulations relating to 'merchandise in transit through the US to foreign countries'? (*Custom House Guide*[25]).

Is there a crane with one hundred tons capacity at Puerto Ordaz? (*Ports of the World*[26]).

What are the current prices of Oiticica oil, Florentine orris root, Madras turmeric, Ammonium thioglycolate, Canadian senega, Papaverine hydrochloride, Haitian bitter orange peel, Chilean crude iodine? (*Public Ledger*,[27] and *Oil, Paint & Drug Reporter*[28]).

A cargo has become a total loss through a collision at sea—what is the position of the charterers as to loss of freight? (Stevens' *British Shipping Laws*[29]).

What are the regulations relating to the labelling of dietetic foods destined for the Brazilian market? (*Food Processing & Packaging Directory*[30]).

Setting up a commercial information unit

I was asked to include in this paper some remarks about setting up a commercial information unit within the context of a general and technical library. Let us begin by considering some of the essential differences between scientific and commercial information. First, the rate of change: scientific facts such as the specific gravity of sulphuric acid remain facts, however much processes, applications and terminologies may supersede one another; commercial facts can change overnight—companies with household names are swallowed up and lose their identity, chairmen of multi-million pound corporations flit on and off the scene, Poseidon shares climb ever upwards while textile manufacturers rejoice at descending skirt lengths. Secondly, much scientific and technical information falls within the scope of academic publishing and is systematically indexed and well documented; but much source material for commercial information is published to serve the immediate practical needs of one class of business user, is not expected to be of any interest to anyone outside that class, serves no possible academic interest until it becomes material for the historian, and is often very poorly documented. The consequences of these two factors are that the operator of a commercial information unit must be prepared to lean heavily upon the few reliable bibliographies and guides available, to face heavy costs of a stock that requires replacement at frequent intervals, and to buy material intended primarily for a different type of user and probably only partly filling the need for which he acquires it.

Apart from the above considerations, which are to some extent academic, anyone faced with the requirement to set up a commercial information unit should (a) insist on the clearest possible definition of what the unit is expected to achieve; (b) prepare a very clear estimate of the *annual* cost; (c) consider carefully the accessibility of the nearest public library, chamber of commerce or similar unit providing a commercial information service, and assess the point of balance between complete self-reliance and complete reliance on the public service. Points (a) and (b) are of course common to most types of information unit; point (c) is of special importance because (i) only the very largest concern will find it economically worthwhile to establish and maintain a unit approaching the resources of the City Business Library or Manchester Commercial Library; and (ii) an efficient public commercial librarian can often obtain information which would not be readily available to a business making enquiries direct to the same source. The point of balance will not usually be difficult to find, but I did know of one management so short-sighted as to let senior market researchers regularly travel two hundred miles (1st-class rail and overnight expenses paid) to use a public library, rather than authorize the acquisition of necessary material at a fraction of the cost.

Apart from those mentioned in other parts of this paper and listed in the table of references, there are several other useful guides to material required in a commercial information unit which I should like to mention: *Commercial Information: A Guide to the Commercial Library*, by A. L. Smyth, FLA, librarian of the Manchester Commercial Library, reviews the whole field of commercial information and is supplemented by a series of *Business Bibliographies*; more specialized works include *Sources of UK Marketing Information*, edited by Gordon Wills (Nelson), *Economics & Commerce: the Sources of Information and their Organisation*, by Arthur Maltby (Clive Bingley), and the series of publications emanating from the Gatt International Trade Centre, Geneva, including *A Bibliography of Market Surveys, by Products and Countries* and *A Guide to Sources of Information of Foreign Trade Regulations*.

Future trends in commercial information

In the case of directories, we have witnessed during the past few decades the decline of many commercially published city and town directories in the face of the growth of telephone directories; this process is now evident even in Germany, where some century-old Stadtadressbücher have been forced to transform themselves into more compact—but doubtless more profitable—shapes. During the coming decade the greatest changes in directories are likely to come from the increasing application of electronic data processing; the computer can, and doubtless will, be instrumental in the publication of more accurate, more up-to-date and more adequately cross-referenced directories; but it must never be forgotten that the computer cannot produce a document more accurate than the net information fed into it. Some of the pronouncements about the introduction of postal codes and the possibility of their wider application has led to speculation about a future in which all directories may be replaced by a central electronic index of every person and organization—with split-second retrieval of any required name or list; no one with even a superficial knowledge of recent progress in EDP would deny the feasibility of this; but whether it can ever be an economic possibility is open to question. In the realm of statistics it is certain that the computer will come into its own, and many are watching with interest the Central Statistical Office scheme for generating fast, accurate figures based on the file of two million businesses now being created at Newport.

A problem that is likely to continue to grow is that of identifying company linkages; the publishers of *Liaisons Financières*[31] have in their Paris office a chart showing chemical company relationships in France; a colour TV circuit diagram is simple by comparison. The continuation in the growth of international companies and their ramifications will mean more complex searches in order to discover whom one is really approaching as a customer or supplier. Perhaps this is a sphere in which those concerned with commercial documentation might co-operate both in the joint exploitation of published material, and in the preparation of a central index of company linkages.

This paper has been almost entirely concerned with documentary sources of information. But often the printed word is too late or there is no time to seek it out; hence the importance of being able readily to identify organizations of people who know the answers. *Marketing & Management*[32] has been designed expressly for the purpose of providing 'contacts' in all countries engaged in a wide range of activities connected with the title subjects; nearer home, the *Directory of British Associations*[33] leads to people with special knowledge of subjects as diverse as sail eyelets and blue-faced sheep; at another level, the *Yearbook of International Organisations*[34] provides a means of identifying world-wide organizations over the whole field of human endeavour.

In giving this paper I have tried to avoid a pitfall and a temptation: the pitfall being to string together an endless succession of titles either too familiar to all or exotic in the extreme; the temptation that of producing an hour-long 'commercial' for my own company's publications. Our many friends in a wide variety of information units never tire of assuring us that they could not manage without the works we publish. Although this is always pleasant to hear, it makes us very conscious of the responsibility to maintain the standards we have set ourselves—particularly in anything we produce that can help the user of commercial information in a task that becomes daily more complex and daily more vital to the economy.

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REPROGRAPHIC SERVICES IN LIBRARIES

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Paper presented at an Aslib Evening Meeting, Wednesday January 21st 1970

Photocopying

A PHOTOCOPIER is now regarded as an essential part of the furniture of most libraries, and during the last decade machines operating on the dry electrostatic principle have almost entirely superseded the earlier chemical copiers. They are usually quicker and easier to operate, and produce a cheaper and more permanent copy. A range of fast automatic pressbutton machines can be hired (or purchased) which will generally provide a copy in about fifteen seconds, at a cost of approximately fourpence for an A4 size sheet. Coin-operated machines are also available for self service applications.

There are two different systems of electrostatic copying currently available, the first being the 'transfer' system used on all the Rank Xerox equipment. Electrostatic copying is possible because certain substances, such as Selenium, have photoconductive properties, which means that they are good insulators in the dark, but become conductors of electricity when illuminated. In the Xerox process, an aluminium drum coated with selenium is charged, as it revolves, with static electricity, and an image of the document being copied is projected on to it. Where the light is reflected from the paper base the coating becomes conductive and the electrostatic charge leaks away, leaving only an imagewise charge. This attracts a pigment oppositely charged, which is then transferred to, and fused on, the copy paper. Copies can also be transferred on to thin card for making library cards; mats for offset lithographic duplication; translucent masters for subsequent diazo duplication; and gummed paper stock for labels and windscreen stickers. All copies have archival permanence.

The book-copying machine in the Rank Xerox range is the Model 422 (now replacing the former models 914 and 420), which can be rented for £5 per month, plus a meter charge on every copy made. The meter charge is at a higher rate (mode 1) on the first five copies from each document, and at a lower rate (mode 2) for subsequent copies of the same document. The only other cost is that of the paper, unless it is necessary to cost in the labour which will add, on average, about one penny per copy to the costs shown on the graph (Figure 1). There is, however, a minimum monthly billing of £25, which results in a prohibitive cost per copy if the machine loading is much below 1,200 copies per month.

Other manufacturers employ a process similar to Xerox copying, but instead of the selenium drum, they image 'direct' onto a photoconductive paper which is, in fact, the copy paper. The paper is most commonly coated with zinc oxide, and rendered light-sensitive by receiving an electrostatic charge as it is fed through the machine. The latent image is developed by the application of a positively charged pigment, either in a carrier fluid called a dispersant, or by means of a magnetic brush after it has been mixed with iron filings. The liquid developer contains a soluble resin which fixes the pigment as the fluid evaporates, otherwise the image is heat fused. Copiers using dispersants do not require a warm-up period and are therefore ready for immediate use, but magnetic brush development is better for solid black areas and improved tonal reproduction. It is also the cheapest method of making short-run offset litho masters, although not all machines offer this facility.

Book copiers using these coated papers are available on free rental from several companies, the only cost involved being the cost of the copy paper, which varies in price according to the quantity that the customer undertakes to use per month, and whether he enters into a one, two or three year contract. The copy price is then guaranteed for the life of the contract. Many users will not wish to bind themselves for more than two years, but the two year contract prices from three leading manufacturers were found to be so close that they almost merge into a single line, and provide an interesting comparison with the other machine (Fig. 1). The Arcor machine is unique in its ability to copy from originals up to double foolscap size. (i.e. 13 inches by 16 inches).

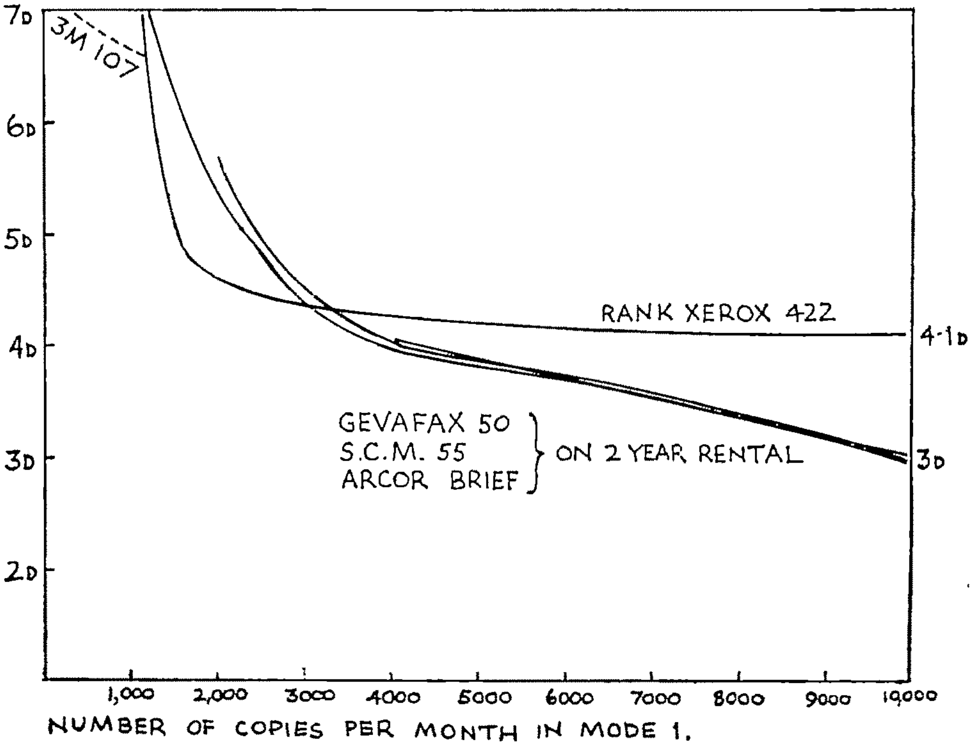

FIG. 1 Book copiers: cost per copy (excluding labour)

If a proportion of the work is for more than five copies per document

(Mode 2), the cross-over point between the 'transfer' and 'direct' systems will move progressively to the right on the graph, and the faster Rank Xerox model 720 may become a more attractive proposition. Large organizations will probably be able to command higher discounts on all these machines, though terms on some seem to be more easily negotiable than on others. At the other end of the scale, small users for whom electrostatic book copiers work out too expensively may be interested in a small 'dry' book copier from the 3M company which operates on the dual-spectrum principle, known as their model 251.

Duplicating

The principal multiple-copying processes are diazo copying; the three duplicating systems, spirit (or hecto graphic) duplicating, stencil duplicating and offset lithography; and Xerox duplicating. Stencil duplicating has the advantage over both diazo and spirit duplicating of permanence and better quality copies, but compared with offset litho, stencil duplicating is of much more limited application and retains only two slender advantages—its capital cost is lower, and it can be operated by anyone in the office.

Paper masters for offset litho duplicators are now cheaper than stencils, and the copies can be run on cheaper but better quality paper than the absorbent variety associated with stencil duplicating. 'Scissors drafting' facilitates the combination of text and illustrations with ease and versatility, whilst headlines and very artistic layouts can be prepared by using the extremely comprehensive range of pressure-sensitive transfer letters and tapes on the market. The range now includes shading tints and textures, and art sheets, an illustrative studio in an album! Lists such as bibliographies, telephone directories and catalogues can be prepared by using a strip-index technique, magnetic-tape typewriter or from a computer print-out. Tabulations together with headings can be compiled, and the paste-up fed into a photocopier such as the 'Bruning' machine, to produce a copy on a zinc oxide paper. This copy can then serve as a master after the application of a conversion fluid, and up to one hundred further copies printed on an offset litho duplicator at around five thousand impressions an hour. The cost per copy is just over a halfpenny each, and can be produced in two or three minutes. Longer run masters can also be obtained for use on this equipment.

The three latest developments in the Xerographic copier/duplicator range are the model 3,600 with optional linked sorter, the model 720 and model 660. These machines copy direct from the original document on to ordinary bond paper at speeds up to 3,600 copies per hour, or one a second. Because they do not require the preparation of a 'master', they are sometimes faster than the electrostatic/offset system, but the copy cost is at least 1.3d per copy on the 3,600, or 1.9d per copy on the 720. As with other Rank Xerox machines there is always a minimum monthly billing, which in the case of the fastest and most efficient model is £115 per month, making it quite uneconomic for users requiring less than ten thousand copies per month.

An excellent paper on the economics of short-run document duplication has been published by Mr A. W. Martyn, the Deputy Co-ordinator of the Government Reproduction Services, H.M. Stationery Office.[1] In this he compares the costings of the electrostatic, diazo, Bruning/litho and Xerox duplicating methods, and illustrates the results in a series of clear graphs. These compare not only the cost per copy, but also the time taken to produce a run of up to twenty-five copies by each of these processes. A similar graph showing typical costings for a central reprographic service in a large organization operating machines at optimum capacity, is shown in Figure 2.

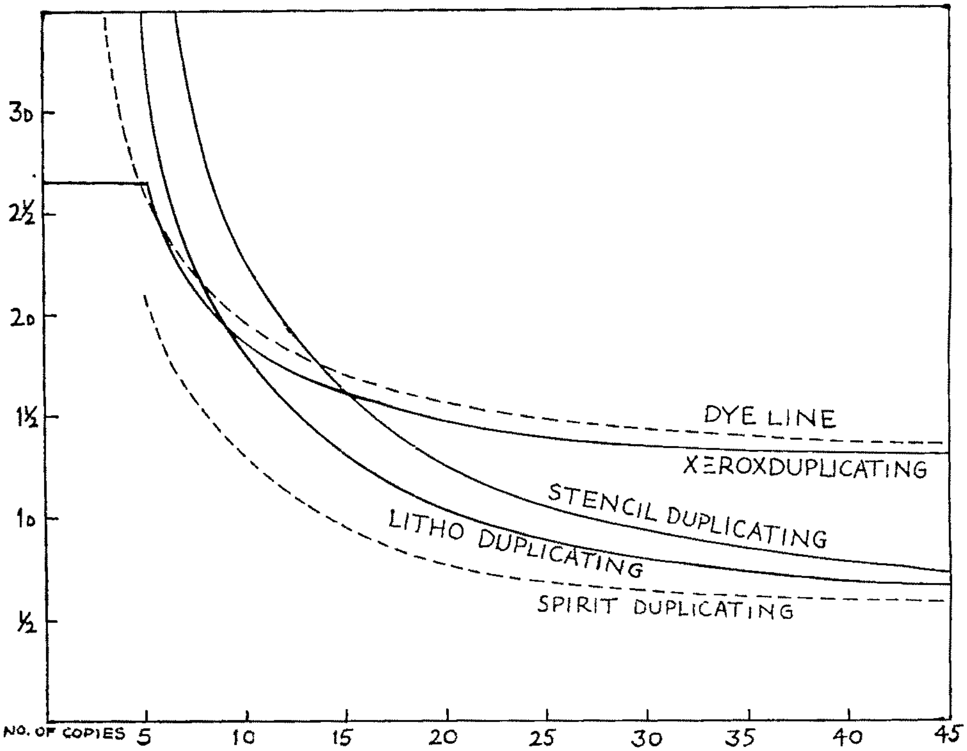

Fig. 2 Cost per copy (including labour)

The Duplicating Library

These developments in hardware gave birth to the concept of the duplicating library as opposed to the more conventional circulating library, and the economic justification for this was analysed with mathematical precision by L. B. Heilprin in a paper entitled *The economics of 'on demand' library copying*, presented at the American National Microfilm Association's annual convention in 1962.[2] He estimated that the cost of loan control procedures and postage accounted for between 10 per cent and 80 per cent of the operating expenses of a large research library and small circulating library respectively. The National Lending Library recognize this fact and advise users that they prefer them to have photocopies because there are fewer hidden costs involved than when issuing and returning books. Pads of requisition forms purchased from them cost £10 for fifty forms, each of which enables the applicant to have copies of up to ten pages, i.e. up to ten pages for four shillings.

The Microfiche Foundation in Holland, under its director, Dr L. J. Van der Wolk, advocated in 1964[3] the use of the microfiche as a library duplicating medium, and when more than three or four pages are required it is probably cheaper to supply a fiche, if the recipient has facilities for reading it (Figure 3). Microfiche readers are reducing in cost as the demand increases, particularly in the USA, and with their more general use the system becomes more viable economically. User resistance declines with improved image quality and screen luminence, and it should no longer be necessary to suffer eye-strain and inconvenience operating the equipment in a darkened corner of the room. The most commonly used format for scientific reports is the A6 size microfiche containing up to sixty pages of information, although there have been suggestions for a library fiche which would contain approximately the same number of pages as an average book.[4] For the publication of patents however, which do not usually exceed more than a few pages, the '8 up' aperture-card is being internationally recommended.

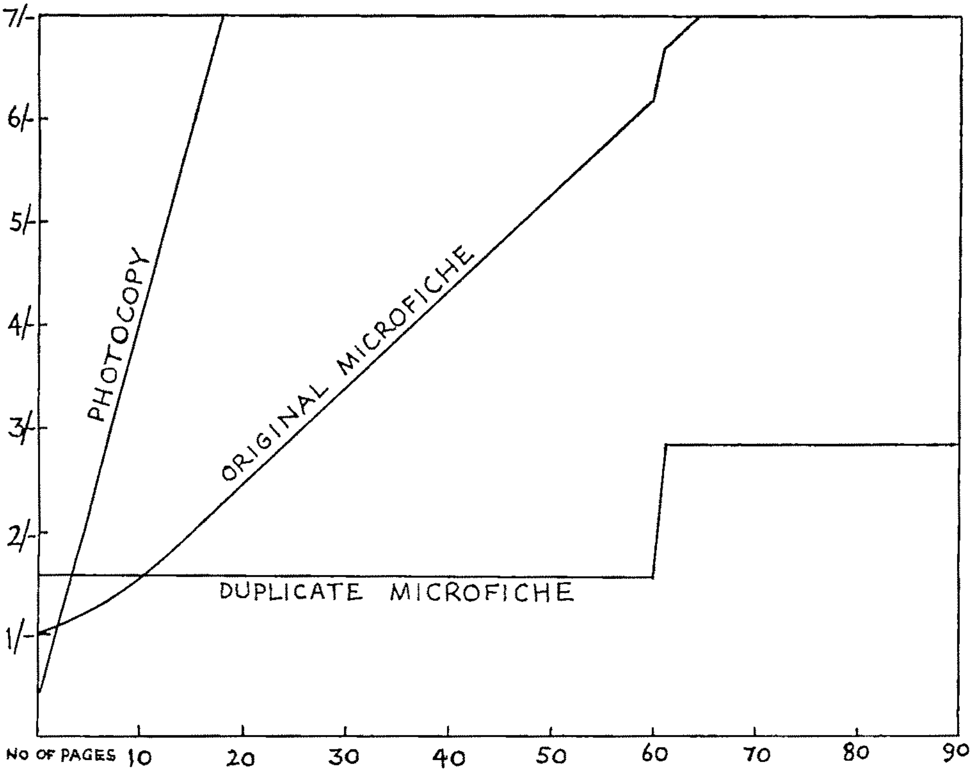

Fig. 3 Copy costs, including postage

The National Lending Library for Science and Technology have for the past six years been receiving information from the USA, in microfiche form at the rate of fifty thousand fiches a year. This Library is now to act as a clearing house for all American atomic power information and to provide an exchange service to the USA. It is expected to generate up to 250,000 fiches a year of its own, in addition to duplicating the incoming American material. The Technical Information Library of the Ministry of Technology also expects to begin shortly to create about fifty thousand fiches a year for distribution. Current holdings of microfiche in all government departments in Great Britain are estimated to be over half a million, and the accession rate about 380,000 a year. The percentage growth during 1968–9 was 76 per cent compared with 55 per cent for 16 mm. roll film. These figures fade into insignificance compared with the estimated total production of microfiches by the US Government of ten million per annum.

A detailed study of the cost of producing microfiche to a satisfactory standard by stripping from 16 mm. roll film has been published by the National Reprographic Centre for documentation, as Technical Evaluation Report No. 69/1.[5] The use of step-and-repeat cameras was ruled out either because they failed to achieve the desired resolution, or because of very high capital expense. In contrast the recently introduced Recordak 'Starfile' microfilm camera is a modestly priced camera which gives the correct 'pitch' for the microfiche grid. As will be seen from the tables published in this report, the cost of a microfiche will depend on the number of pages it contains, but the average cost is about three shillings for thirty-six frames. If the number of pages requested on the average inter-library loan is less than ten, it will be seen from Figure 3 that it is cheaper to make an original fiche than to duplicate one, although this cost does not include the library staff's time taken in producing and returning the volume to the stack. A higher figure of $1.8 to $2.1 for an original fiche was quoted by A. Teplitz in *Library Fiche: An Introduction and Explanation*,[4] but this is probably based on the use of the more expensive USA cameras. The same author gives the price of a duplicate fiche as 15 cents (1*s* 3*d*), which tallies with the costings given in Figure 3. It is interesting to compare these prices with the cost of requisition forms for the loan of a book or supply of a fiche (at the discretion of the NLL) at £4 for a book of fifty forms, i.e., 1*s* 7*d* each, no refund being allowed if the item is not available. Technical Reports from the Royal Aircraft Establishment are available in microfiche form at four shillings each, or 37*s* 6*d* for a sixty page report in hard copy.

Printing out enlarged copies from the microfiche has always been an expensive procedure, and is generally discouraged since it regenerates the paper storage and retrieval problem which microfilm was meant to solve. There will be occasions, however, when it becomes necessary, and it is possible that the next generation of photocopiers will be dual-purpose machines able to supply copies from either hard-copy or microform input, such as the recently introduced Rank Xerox Microprinter. Alternatively, separate microfilm reader/printers such as the Filmarcor or Bell and Howell 'Reporter' may be preferred. These electrostatic models will reduce copy prices compared with many machines in current use.

To realise the full benefits of the microfilm based library of the future will require the application of efficient retrieval systems, or the information in its miniaturized form will prove even more elusive than in its full size. Simple systems are likely to be the best for smaller libraries, but many sophisticated systems have been developed for those whose libraries and budgets are large enough. A relatively inexpensive device at £1,000, which provides random access in four seconds, to any frame on 750 microfiches contained in a rotating carousel, is the Houston-Fearless CARD reader. It has a binary coded computer interface, and employs an automatic needlesort mechanism to select and display the appropriate information on its built-in screen. One of the most interesting experiments at present is the Information Transfer Experiment (INTREX Project) being conducted at the Massachusetts Institute of Technology, in Boston, USA. The full text of the Engineering Library at this university has now been recorded on A6 microfiche, and the intention is to be able to access this information via a computer-based augmented catalogue by dialling on a telephone. The nearest match to this request will then be transmitted and displayed on an adjacent television screen, at enquiry points throughout the campus. This may well be the pattern of things to come elsewhere.

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DISCUSSION

MR T. A. KING (Southampton University Library) asked if the new Xerox machine described by MR MORGAN was still in the experimental stage or in production yet in the USA. MR MORGAN replied that this machine was in production and had been on the US market for at least twelve months.

MR G. WHATMORE (International Publishing Corporation) asked whether a cheap microfilm reader for use in the home was ever likely to be available. MR MORGAN replied that the US Department of Education had financed research into producing a cheaper microfilm reader for use in schools and universities. Their aim is to produce a reader costing about $50 (about £20). Plans have been drawn up for the reader and a contract has been awarded to a firm called DASA Corp. MR MORGAN went on to say that this type of reader, however, would probably cost about £50 in this country. As far as manufacturing such a reader over here was concerned, this would only occur if there was sufficient demand. He said that small hand viewers are available for use in the home but not for any length of time. He compared the price situation of readers with that of slide projectors some years ago. Before colour photography, slide projectors cost about £70, but now it was possible to get one for £20. It was quite possible therefore that the cost of microfilm readers would fall in a similar way. He did not think however that the price would go below about £25.

MR P. HAMILTON (Beecham Research Laboratories) said that, with reference to the comments and comparison of duplicating by offset litho or by Xerox (rather to the detriment of Xerox), it was fair to point out that most Xerox machines are being used to do two jobs, straightforward copying and duplicating. He said that to do this by offset litho one needed a copier as well. MR MORGAN agreed with these comments but said that he thought Xerox prices were still too high compared with duplicating by offset litho.

MR R. D. WIGGINS (Fisons) said that, with reference to the section of the paper dealing with the Duplicating Library as opposed to the Lending Library, it seemed that there were two alternatives: either (1) to have all or most of one's stock on microfiche so that borrowers can have a Kalvar or dyeline copy on demand; or (2) make an original (which the speaker said averaged six pages) and give it to him. The borrower may then have to wait until the entire one hundred feet of film is used, sent to the processors and received back. He asked if this was not a defect in the system. MR MORGAN replied that there could be a difficulty here especially in extreme cases of only one request per day. One did not have to use the whole film, however, before processing, even though this might be wasteful; and one also had to take the immediacy of the demand into account here. But all this depended largely on whether one had one's own processing facilities or not. A recent alternative to the adhesive systems on the British market is the MARC system marketed by the makers of the Microgen projector which costs about £72. This is a system whereby film can adhere to highly polished plastic through surface tension in the same way as the plastic container holding a car licence adheres to the windscreen. This allows one to make up fiche very readily and can be used with both 16 and 35 mm film. MR MORGAN was not sure, however, if this was available yet.

MISS G. C. GRIFFITHS (IBM UK Ltd) mentioned the availability of Huygens portable reader at a cost of £40. She also asked how long 3M's took to process film and return it. MR MORGAN thought that 3M's would offer a fairly prompt service. He would expect a twenty-four, or at the most a forty-eight hour service from them.

MR R. C. WRIGHT (Royal Aircraft Establishment) said that it would be a pity to make a large capital investment in readers only to find that someone then marketed a reader/printer which would produce paper copies at perhaps 2.4 pence per page. (The reader would then prefer the paper copy.) He asked if this was likely to happen, in which case we could then use the microfiche simply for storage. MR MORGAN said that this had already happened with the Filmarcor machine which prints out at approximately these figures. The cost of this machine was about £1,500. The alternative is the Bell and Howell machine costing about £1,000 which prints out at about three to four pence per copy. These were the two best reader/printers at the moment and far more economical than the 3M or Kodak machines which print out at about a shilling a copy.

MR F. COCHRANE (Board of Trade) asked if MR MORGAN had any figures on facsimile transmission as a means of transferring information. He also asked if MR MORGAN was concerned with copyright problems in relation to reprographic services. MR MORGAN replied that we were all involved in copyright problems and that the same regulations applied to microcopy as to full size copy, and in this respect he was certainly concerned with copyright matters. As for facsimile transmission, he had no available figures on this process. He had, however, looked at the costings of videotape transmissions but these seemed to be fairly expensive, more so than microfilm. He did not think that facsimile transmission would be economically feasible for use in libraries.

MR F. H. SMITH (British Transport Staff College) asked whether any research had been done into the time a reader can tolerate using microfiche, e.g. from an eye-fatigue point of view. MR MORGAN replied that the University of Denver in the US had carried out research into user acceptability of microfilm by comparing microfilm with hard copy. He also said that he was a member of a Working Party of a Committee of the British Standards Institution which had enquired into the legibility requirements for microfilm. He did not think, however, that under optimum conditions, there was much difference between microfilm and hard copy as far as eyestrain was concerned, but then it was difficult to make any direct comparisons. If microfilm had the same image quality and contrast as hard copy, and if the size relations were the same, then one could make these direct comparisons. It was true though that eyestrain was higher on older readers than on newer, better quality ones.

MRS J. M. MOGFORD (BP Chemicals Ltd) asked the speaker if he would comment on the problem of finding a reader/printer for *Chemical Abstracts* which accepts cassettes, uses an electrostatic printing process, and preferably has a zoom lens for enlarging and copying a single abstract from the frame. MR MORGAN replied that the price would be frightening if one did find one! But Kodak's have a reader which could take printing facilities, a zoom lens, and cassettes, though this would cost over £1,000.

THE CONSULTANT'S ROLE AND METHODS: THE WORK OF THE ECONOMIST INTELLIGENCE UNIT

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Based on a paper presented at the Aslib Chemical Group Conference on Commercial and Marketing Information, 15th–17th April 1969

THE Economist Intelligence Unit Limited was established in 1946 as a department of the Economist Newspaper. *The Economist* itself was founded in 1843 under the rather elaborate name *The Economist, Weekly Commercial Times, Bankers Gazette and Railway Monitor, The Political, Literary and General Newspaper* and the Intelligence Unit was its first offspring in over a hundred years. The Unit was designed to be a vehicle by which the experience, skills and knowledge of the staff of *The Economist* could be used to provide information and advice on the complex problems of doing business in the postwar world and to do this for fees. The Unit was to have a small staff of its own to supplement the talents of the existing *Economist* staff.

This system was not maintained for very long in practice, for a number of reasons. First, the conflict of deadlines for the magazine and deadlines for clients was insuperable. Second, the type of work which it became evident the Unit would do required strict confidentiality—which could be thought to be a difficult matter for a journalist—and increasingly greater depth and detail, meaning different techniques, training and types of people. It thus became apparent that two different operations—running a weekly newspaper and establishing and running a research and advisory group—required separate organizations and staffs and this was soon implemented.

The EIU developed rapidly: the staff numbered twelve at the end of 1947, thirty in 1950 and nearly sixty in 1956. At this point it was decided that what was becoming a sizeable business needed to be operated as a separate company and in 1956 it was established as a wholly-owned subsidiary company of the Economist Newspaper Limited. The staff now numbers slightly over two hundred in London with perhaps half as many working for us overseas.

The organizational structure has of course had to change to accommodate the increase and the widening of the range of work. The current structure consists of four major divisions plus a small number of semi-autonomous departments. The divisions are as follows:

(1) *Transport and Energy.* This division, staffed by economists, is mainly concerned with feasibility studies in two areas, transport and energy, where projects tend to be on a large scale. These studies have been carried out in a wide range of countries—particularly in Africa and Asia—and for a wide range of clients.

(2) *Advisory Services.* This group embraces the entire range of management

and marketing specializations. It is staffed by marketing specialists with practical experience of sales, advertising, product development and consumer research, and by economists, accountants, engineers, and data processing specialists. They are all experienced in commerce and industry and can, therefore, interpret technical expertise with practical experience. The work of this division covers such areas as: organizational surveys, corporate planning and marketing programmes.

(3) *Market Research.* This group is the largest of the four divisions and closest to the original work of the EIU. It is staffed largely by economists and is primarily concerned with domestic and overseas market research projects, with market intelligence services, with product selection, modification and diversification. It works not only for manufacturers but also for agricultural and other primary producers and its services extend to least cost buying studies and services.

(4) *Development and Planning.* The last major division is basically concerned with macro-economic work and with planning research for private clients and public authorities. It is this division which, for example, is currently engaged in carrying out the study of the potential effects of Scottish independence.

Amongst the autonomous departments are Statistical Advisory—which assists clients in the use of modern statistical methods, notably in the fields of quality, inventory and purchasing control—and Publications, which is responsible for the sixty-two *Quarterly Economic Reviews* covering 130 countries which the EIU publishes.

These divisions and departments are by no means separate from one another. More often than not a project requires and receives a contribution from two or more parts of the organization. The integration of the various divisions is, in fact, one of the strengths of the EIU.

I have spent some time in outlining this basic history and organization of the EIU in order that the discussion which follows may be seen against the background of the type of organization which carries out the work. Were the EIU a different type of company then no doubt our approach to the obtaining and use of techno-commercial information would be different. But we began in market research and we are still founded on this requirement.

To some degree we in the Economist Intelligence Unit regret that the word 'intelligence' has not only connotations of espionage and covert activity but that it has also been downgraded from its rightful position. If we start with the definition that 'Intelligence is a meaningful statement derived from information which has been selected, evaluated, interpreted and finally expressed so that its significance to policy problems is clear', then it may be seen that marketing intelligence or commercial intelligence is a wider term than marketing or commercial research. Market research is a useful tool for the worker in market intelligence, rather than the other way round.

There is, however, some difference between the normal, as opposed to the proper, use of the words 'research' and 'intelligence'. A commercial research project normally focuses on a specific problem, has a beginning and an end, and fairly tight terms of reference and objectives. Commercial intelligence on the other hand is a continuing process designed to monitor the market, the competition or a particular part of it. Possibly commercial research is appropriate once the problem or opportunity has been identified, but it is intelligence which will first spot the problem or opportunity.

The EIU provides services of both types to its clients, and also operates some which combine intelligence and a market research provision as required. They are mainly operated by the Development and Planning Division and the Industrial Market Research Division separately or jointly and frequently utilize the services of other divisions and departments. Most are international or at least cover more than one country so that the services of the EIU network of foreign offices, companies and research correspondents is usually required. However, in order not to complicate the discussion it may be assumed that services provided on any foreign country are essentially put together in the same way as a comparable service in the United Kingdom and from the same types of sources.

A number of different types of services are prepared of which two are most easily identified—general subscription and custom-built. The general subscription services which the EIU prepares are either country- or industry-based. The country-based service is primarily the *Quarterly Economic Review* series which seeks, in a systematic way, to monitor the significant developments for businessmen interested in a particular country. This service identifies major developments and attempts to assess their importance but it can make no pretence to being exhaustive. The subscriber will clearly be well-informed about major developments in the country or countries to which he subscribes. He will, for example, be kept up to date with the progress of the Five Year Plan, with developing government policy towards private or foreign investment, taxation or state-control. He will also be informed about major industries and their progress and about significant new investment. However, he cannot expect to have the significance interpreted for his particular industry, unless there is likely to be wide interest in this.

Similarly, the industry-based series must also be selective. The quarterly *Motor Business* while it monitors the industry in the major countries will not often discuss its development in Mexico or Brazil. Nor will *Hard Fibres*, although it is exhaustive about sisal in East Africa, often cover the minor producing countries. Moreover, in this area we have not attempted—as yet—to cover all industries, although it is our intention to add other bulletins in due course. But they must continue to be selective in their coverage since the subscribers are a diverse group.

It is, in fact, only the custom-built services that can properly attempt to be exhaustive on a particular subject. The EIU operates a number of these for clients. The most usual type is a monitoring service on, say, a particular product or a group of products. One such service, for example, might cover development in the glass industry or might be further refined to cover only glass in packaging in one country or in a number of countries. Another might cover major plant-building projects—an early warning service for a major contractor or equipment supplier, for example. Yet another might be on a financial subject such as Eurodollar issues. The range can be, and is, extremely wide. The depth of such services and their scope can similarly vary and the kind of work involved can range from pure desk research to much more elaborate research procedures. What they have in common is that they are specific to a particular client's interest and are exclusive to him.

Alongside the regular services—and sometimes associated with or arising out of them—are specific research projects, carried out to find the answers to a specific problem of current importance. If, for example, the glass packaging service mentioned above turned up indications that the competition had developed a new process or product, a specific piece of research might be indicated to assess the effects on the market, the timing, the price and the customer reaction.

These then are the types of service in the area of techno-commercial information. How is the material on which they are based collected, interpreted, stored, retrieved and disseminated?

First, collection. The basis of all research in this area, as probably in most others, is thorough examination of data needs. What does the client need to know and therefore what questions are we trying to cover? The data needs for those preparing the service will obviously be greater than those expressed by the client since a background wider than the topics to be covered in the reports to the client is essential to the proper preparation of these reports. Although the client may be concerned only with glass packaging it is essential for the researcher to be at least aware of tangential developments in areas affecting glass packaging and the industries which either do or might use such packaging. Hence the researcher must first develop the questions. For a full market intelligence service there are four main research categories:

what is the competition doing or getting ready to do?
what are the consumers doing?
what are suppliers doing?
what is happening to the environment in which the client operates?

(The latter is perhaps the only one deserving any explanation. By environment here is meant government measures and attitudes, basic economic conditions and trends, finance and foreign exchanges and similar factors which make up the conditions of business life under which the client must operate.)

There may be additional questions in certain industries and businesses—for example, a need to know what scientific research is going on in universities or government bodies—but for the most part the basic questions fit into the four main categories.

There are, of course, additional or preliminary questions which need to be established with the client which define the product, such as:

the materials used
the machines, equipment and processes
product applications—end-use or intermediate applications
the markets served
the competition

and the like.

Having established the questions within the four broad categories—or those with which the service is concerned—how is the material collected? There can be no doubt that the primary source of data is commercially published material and newspapers in particular. The use of newspapers can either be carried out directly by staff or by using a press cutting agency: the latter, however, is rarely satisfactory because establishing broad enough terms of reference is difficult. The business, financial, and economic pages are obvious sources for the kind of material which is required but the other pages should not be neglected, particularly the 'situations vacant' for some types of information. Weekly magazines—particularly *The Economist, The Investors Chronicle* and the like should similarly be examined: there are equivalent papers in most countries. Next, the trade press. This needs to be studied in the greatest depth possible, including, and perhaps particularly emphasizing, the advertisements: these may be the first warning of a competitor's product development. The trade press sources utilized should not be confined to those concerning the product itself. To return to the example of the study of glass packaging, the obvious trade press sources are those dealing with packaging, food and other products which may be packed in glass. But the trade press dealing with plant and machinery will also repay study, admittedly with a lower frequency of worthwhile material arising but possibly with greater overall significance when it does arise.

Amongst the published sources which are available free are company reports, catalogues, service manuals and all the other materials which all companies make available to their customers, shareholders and the public. They are, of course, quite equally available to the competition and it is often surprising what indiscretions can be found in these sources. The omissions too are frequently very significant. Stockbrokers' reports are also often excellent sources, even for technical material and particularly for commercial comment on technical development and for what is often—but not always—a reasonably accurate assessment of the commercial viability of a new development. Stockbrokers' analysts seem often to get better and more detailed information about a company and its plans than do reporters for the press and these analysts, or at least some of them, are skilled at picking out the essentials.

There are, of course, also government publications. The problem here is knowing what is available since HMSO alone issues seven thousand or more titles a year. There is however the *Daily list of Government publications* and an annual catalogue as well as the occasional *Sectional Lists,* all of which are worth taking. To these should be added the journals of the appropriate societies, best located probably in Butterworths *World List of Scientific Periodicals* and similarly the appropriate abstracting services.

Finally amongst the printed sources there are what the *US Marketing Information Guide* called 'way-out' sources. This is a field normally neglected by the researcher and is probably bound to remain so. It comprises such publications as hobby magazines, what the *Guide* calls the 'buff' press, where enthusiastic amateurs reveal their researches and where out-of-the-way statistics are frequently given. The researcher into, say, railway equipment would be well advised to study the railway enthusiasts' magazines.

It should here be noted that an exceptionally useful source of data is also very often neglected. This may perhaps best be classified as 'Exploiting the Publisher'. The researcher can, and often should, check back on the published material by contacting the editor or publisher and asking for explanation, amplification or even the source of the data. Frequently there is more material available than appeared in the publication and at least some of it can be extracted, although it must be added that the method works better with magazines than with newspapers.

The next major group of sources of importance are the materials and data available inside the company—in the EIU's case this of course is the client company—and with the company's suppliers and distributors. This material may be already in the right form but going to people or departments who do not or cannot use it. More usually that data will not be in the right form but can often—even usually—be readily adapted. For example, the sales force call-reports often either already contain some useful research data or can be adapted to serve this purpose, given a certain degree of co-operation by the relevant departments. Extracting information from suppliers or distributors calls for a considerable amount of co-operation and usually also for some return in kind, a point to which it will be necessary to refer again.

The third and last group of sources may best be called 'contacts', which may prove the most fruitful of all. The stock in trade of a company like EIU is in its experience and its knowledge of people who are likely to have the requisite information and who will be able to share some of it. There is then a need to establish a wide range of contacts, through trade and industry associations, professional bodies and similar groups, not only in your own industry but also in other related fields and areas of potential interest.

In this area of data collection there are, however, far more problems than in the others. Ethical difficulties necessarily arise. This question as well as that of where the more useful material arises has been studied in some depth in the United States where the science or art of commercial intelligence is, of course, highly developed. The most striking thing about these studies is that while they tend to agree that in the USA questioning customers, suppliers and distributors of the competitor, exploiting social or professional contacts and hiring away the staff of the competitor are acceptable, while wiretapping, bribery and misrepresentation are not, the most useful source of data is the reports of the company's salesmen and the second most useful is published data. The third most useful source was generally found to be personal or professional contact with a counterpart in a competitor company, and a phrase occurs in a study by Professor Albaum of the University of Pittsburgh which is probably significant. 'The camaraderie among professional personnel often exceeds any company loyalty.' It perhaps may be doubted whether this could be applied so confidently in the UK (and indeed British researchers would also eschew some of the other methods mentioned). Whether it does or not the basic rule about contacts is that they work on the mutual obligation system. Any kind of assistance given imposes a return obligation and it is, therefore, advisable to be sure precisely how important a question one is asking for fear of incurring a similarly large obligation. Nonetheless the correct use of personal and professional contacts remains a vital source of information.

These, then, are some of the sources from which material is collected. The next step is interpretation, not as is sometimes suggested, storage. Material obtained should in our view be interpreted or at least evaluated before being stored as a general rule—thus at the very least reducing the amount of data of low utility which is retained. The process of interpretation is one principally of manipulation of pieces preferably against the background of a pattern. The interpreter needs to be continually seeking to find a pattern and to assure himself of its continuation since it is primarily when the pattern breaks or alters that a significant development is discovered. Again it is probably easiest to illustrate this by example.

Assume first of all that part of the regular information flow across the interpreter's desk is an analysis of advertising expenditure on a group of products by the major producers. According to the pattern—which may be kept in a formal or informal way—Company A should be spending an amount X: the analysis shows that its expenditure has declined. Some change is clearly indicated, which may be minor and usually is, but which may have substantial significance. It could mean, for example, that the product is going to be replaced. The interpreter's next step is to call for all the related material. Do the trade magazines offer any clues or do the sales force's reports? If they do this is probably a signal to move over from the normal intelligence service to a project approach. (In the case of EIU services at this point we would refer to the client.)

More data is brought together—the last annual report of Company A, the latest brokers' report. Contacts and other sources are used to ascertain whether the company has installed new plant, advertised for additional or different staff or made high level appointments. What can be ascertained about these appointments: did one of the men give an interview to the trade press or sometimes the company's house magazine?

What can be discovered of his background? He is probably listed in one of the directories or may have been written-up at some time in the trade press or again in the house magazine. What does he specialize in and what are his strengths? It may be equally interesting to ascertain what the composition of the rest of the project team is and how this fits with what can be learned about the plant and equipment which may have been ordered or installed, and how the two components relate to any recent advertising.

Usually by these means—a piecing together of small items of material, which is essentially what military and all other intelligence requires—one can arrive at a reasonable hypothesis about what Company A plans to do. Normally the broad outline will be clear, a new product or a development of an old one, and the process too may be reasonably apparent. What will not be clear will be the details, (a) the timing, and (b) the economics. At this point there is a need for other kinds of expertise than the researcher and intelligence interpreter may have. Most probably these must be sought from other parts of the company (or in the EIU's case, from the client). There may be a need for the Research and Development staff to consider whether the hypothetical process is practicable for Company A's facilities. Similarly the Production department may be required to assess whether the guessed-at economics are within the bounds of possibility.

The depth and the detail to which this work needs to go depends first on the importance to the company of the potential competition and its judgement of the effects on the market, and second on the amount of detail which it may feel it needs to decide on the right reaction. Sometimes it may be enough to know the broad outlines only. If, however, it is thought to be necessary to estimate, for example, the costs of the process—in order to arrive at an approximation of the potential product price—then this can sometimes be done with a reasonable degree of accuracy although considerable work may be required. Few new processes appear completely unheralded: in most cases laboratory work will have preceded them by some considerable time and this guide can be used. Capital costs can, normally, be determined while some components of operating costs are again easily obtained, perhaps labour, fuel and some materials most easily. Once again the task is one of piecing together the relevant items, drawing tentative conclusions and testing them.

There may, of course, be additional work for the research/intelligence department. On the basis of the hypothesized costs what will the selling price be? This again depends on a variety of factors, most notably the state of the market and the effect on it of the new product. A similar calculation will be being made by Company A's own staff and it may be possible by studying their past record to draw conclusions as to the findings they will be likely to reach, and therefore to modify the conclusions about price and effect on the market. Subsequently still further research may be needed concerning, say, the reaction of other suppliers to the market and, of course, the effect of the action which your own company will take. For all of these purposes further data is required and interpretation is needed.

The most important remaining stage in the process is, or should be, storage and retrieval of data. This is a subject on which a great many words have been expended in the last few years. A recent check on half a dozen books relating to the subject showed that in all but one they were deep into automated information centres, time sharing and multi-market model building within a few pages. This is not to imply that electronic data processing is not of immense value to the researcher but rather that it overshadows too much of the storage and retrieval process. In a way this may be an argument against it.

The first, and by far the most important step in the process—assuming that it has been properly determined just what is needed for the information system—is the process of coding and classification. The precise coding used is a matter of choice but the objective must always be to leave a margin for later subdivision into more refined categories. The same applies to indexing whether this is to be on 2×4 cards or itself computerized. Cross indexing is important, of course, but may be something of a trap. In recent work on the subject it was suggested that where an article going into storage described deep sea fishing in winter off New Jersey the cross indexing should include 'fishing', 'Coastal fishing', 'New Jersey' and 'winter fishing'. Adopting this kind of system will certainly mean that all possibly relevant data will be retrievable but in such quantities that it may overwhelm the researcher. This again is an argument for interpretation—or at least evaluation—before storage: the rule of the system should be that the researcher can obtain sufficient data by referring to the index and classification but not that he should be supplied with every word on the subject.

The process of classification should clearly include providing some kind of rating as to the importance and reliability of the material. Even after evaluation, which should eliminate the worthless, there will be shadings of reliability in the material put into storage and these must be noted at the time. Was the material from a trade press editorial—often a piece of special pleading—a business note or the result of a salesman's call, and how should it be rated for reliability and significance? Here again, incidentally, is something of an argument against all-out computerization; nothing looks so definite and certain as a computer print-out whereas a yellowing cutting in a file may precisely suit the quality of the information contained in it.

The next most important step is a built-in provision for examination and up-dating of material: this may be and is called a 'self-activating feedback loop', even though it may merely mean that someone periodically throws away the older and superseded press cuttings.

Given that these systems are established and operational the question of actual storage and retrieval is a relatively simple one. The amount and complexity of the data to be stored and the frequency of need for access to it govern the method to be used. It may be that all that is needed is a well organized set of files and a card index: product, company and competition, environment, broken down into the relevant sub-categories. For the EIU's purposes to date these systems have proved perfectly adequate. Regularly arising general material is classified and indexed by our library staff and filed by them. Other material is classified and pre-indexed by researchers responsible for particular countries, industries or products and again handled by the library. Review and up-dating procedures are established for material of various classifications and by groups of files and performed by the library staff.

In other circumstances it will be appropriate to utilize computerized systems which EIU is currently working on and may well use soon. The advantage with this system, other than the obvious speed of search and retrieval, lies perhaps in the possibility of linking the company's data storage to some outside source such as is already being developed in the United States. The United Engineering Centre in New York is to have an automated information pool comprising the information resources of the Engineers Joint Council, The Engineering Index and United Engineering Trustees. The Carnegie Institute of Technology has over two thousand economic series stored in a computer and available for economic analysis and forecasting. There is even a service which will provide statute law and case precedent from computerized storage through a telex machine. Possibly in this country we shall have The Social and Economic Centre at the University of Essex filling some of these functions.

It may be noted that not all of these information systems have been an unqualified success. One service in the United States which was established to sell computer-prepared market research reports has not started well. It was designed so that the statistics supplied by a particular company could be run against the experience of the industry itself to identify weak sales areas, opportunities and potential customers. The problems seem to be first, that the available data was not sufficiently detailed and that down-time for inserting new data was too great. There will doubtless be other teething troubles, even in the United States, where information is more freely available than anywhere else in the world. It is doubtful whether these outside generalized services can replace—although they can clearly supplement—the in-house information service.

Dissemination of information is, of course, the final step in the process. For a consultant research organization this is not a problem since the destination of our services is established for us by the client. The results of these services moreover tend to be used more often than those provided by in-house information systems since they are paid for more directly and more obviously.

For the in-house information system, however, there are clearly problems. Dissemination was described by an American expert recently as sending too many overly-long, overly-regular reports to too many people. There is some truth in this and probably too many researchers provide too much material. If the monthly report has always been twenty pages long the chances are that it always will be whereas it may be that no more than five pages are needed to pass on the message that very little has changed. The *ad hoc* report is greatly to be preferred if the company can be persuaded that the department is not merely reducing its work-load.

For *ad hoc* and for regular reporting there are certain rules which we have established—in part for our own protection. First, the amount of detail should be proportionate both to the importance of the development being reported on and to the position of the man who will receive the report. The executive summary is frequently worth preparing. Second, the report should show trends and exceptions—patterns and breaches in the pattern—and while it assumes that earlier reports have been read it also repeats their general conclusions. Lastly, it is essential to identify first, which are the facts, second, which are the probabilities and third where the hypotheses and conclusions begin.

This last point is probably particularly important. The commercial intelligence department, or its equivalent, is going to have to make hypotheses and to arrive at tentative conclusions based on less than perfect evidence, even if it should in the future have access to a data bank of almost infinite size and a system of almost infinite sophistication. The researcher in this field is in the business of guessing the whole picture from the evidence of a few small pieces and he can rarely sit on the fence—or at least he rarely should. His role is to provide an early warning service and to interpret and expand on the warning as required. In the future there is no doubt that he will have extensive assistance from the computer. Increasingly companies are setting up models of the business, its markets, competitors and customers. These models will not merely be able to accept new up-dating material but they will be so programmed that they can warn of significant change with a certainty that all factors available have been considered in arriving at this conclusion. But it will continue to be the intelligence department which decides when a development is critical and it will still be the intelligence department which has to get down from the fence.

DATA CO-ORDINATION IN THE CONSTRUCTION INDUSTRY

ALAN GILCHRIST
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A brief review of progress made by the Ministry of Public Building and Works in its programme of studies on data co-ordination in the broad areas of a preferred vocabulary, classification categories, conventions, a central commodity file, procedures and codes.

Introduction

THE Construction Industry has several unusual features which make it unlike any other. Because one of the first things that man did was to build a shelter to protect himself from the elements, it can be counted as one of the oldest manufacturing processes. Today, the Construction Industry, which encompasses both the Building Industry and Civil Engineering Industry is one of the largest, having an annual turnover in the UK of £4,000 million. At the same time it is an industry in which, for the most part, each product is unique, is manufactured on site, and is designed and built by a team made up of professional groups (architects, quantity surveyors, structural engineers, contractors) who may never have met before. It is as a result of these factors that technical information (as understood by information scientists) and processing information (a concept that is wider than would normally be met by designers of Management Information Systems) are more closely interwoven than in other industries. The industry recognizes two main types of information contained in:

(a) General Documentation (GD) containing, for example, journals, standards, reports and trade literature.
(b) Project Documentation (PD) containing those documents generated during a particular project containing, for example, drawings, specification and bill of quantities.*

During a project the designer draws on General Documentation and his past experience (in the form of previous Project Documentation which now forms part of his private file of General Documentation) and generates a new set of project documents which are basically instructions concerning the erection of the building. The problem has been stated in these terms: 'An architect may design the world's most advanced building, but unless he can describe clearly to the contractor how he wants it built, and unless the contractor can describe equally clearly to his suppliers what he wants in the way of materials and components, its realization can be a painful process.' And this statement can be set against a background of an increasingly complex technology and rising labour costs. Naturally, the industry has not been unaware of these problems and there has been a great deal of work in recent years attempting to improve information flow. A few examples, by no means exhaustive, will serve to illustrate this activity.

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* One definition of PD contends that it contains all information which relates to a particular project, including relevant items of GD.

1. Some practitioners, in both the public and private sectors, have reorganized their offices into teams based on design stage rather than on the professions involved.
2. Other innovations, with an economic basis, include the 'package deal' and 'serial tendering'. In the first, a contract is placed by a client direct to a contractor who has full responsibility for designing and constructing. In the second, a contract is placed with a contractor for a set programme of work instead of a particular project. Both these procedures can have a profound effect on data co-ordination.
3. Quantity surveyors have been quick to exploit the computer for the production of the bill of quantities, and this has enabled them to provide the contractor with alternative sortations. Other possibilities include the production of activity networks and improved cost analysis.
4. Several organizations have devised classification schemes and information systems for the cross-referencing of project documents and the improvement of information flow. One of the best known of these is the second edition of SfB, now known as CI/SfB or the Construction Indexing Manual, which is intended for use with both GD and PD. The approach has some affinities with the use of SfB in a computer based system pioneered by Bindslev and Burgess under the trade name CBC (Co-ordinated Building Communication), and described extensively in *Architects' Journal* from 1964 onwards. More recently, arising out of studies carried out between CLASP (Consortium of Local Authorities Special Programme) and the Nottinghamshire County Architects Department, a computer based system has been devised which is based on a scheme published under the name of the Building Industry Code. Exciting work is going on in the County Architects' Department of West Sussex County Council, using a CRT and light pen for computer-aided design and documentation. This is based on yet another approach to the problem of data co-ordination.

Conscious of all this development and the attendant risk of conflict, the Ministry of Public Building and Works is currently engaged in an ambitious programme of diagnosis and treatment of some of the communication problems of the Construction Industry.

History

The current project stems originally from the Committee on the Application of Computers in the Construction Industry, set up by MPBW in 1965. Of the four areas considered by this Committee, one devoted to 'Coding and Data Co-ordination' was recognized to be of such fundamental importance that a Sub-Committee was formed to look into this area and report to the main Committee with recommendations for further work. Under the guidance of this Sub-Committee, the investigation was carried out by an inter-professional team at the Building Research Station with the additional help of eight firms of consultants. One of these was Aslib which was asked to review information systems in the Construction Industry. The project culminated in a main report published by HMSO[1] and eight Current Papers on specific aspects, published by BRS.[2] The main report recommended that development work should be undertaken in six main areas:

1. A preferred vocabulary
2. Classification categories
3. Conventions
4. Central commodity file
5. Procedures
6. Codes

To examine these proposals, the National Consultative Council set up a Working Party on Data Co-ordination in March 1969 which is supported by a full-time group at MFBW and a number of consultants. It is important to understand that it is not the intention to devise a master system which would be imposed on the industry, but that the approach is to encourage the convergence of systems and to promote compatibility through a clearer understanding of the information requirements of the industry. The Aslib consultancy service is under contract to MPBW and has so far been concerned with the first three areas of study.

Preferred vocabulary

Work on the construction of a thesaurus of construction terms had already started in January 1969 before the main report had appeared and was under the sponsorship of CIRIA. This project, being conducted jointly by the Brixton School of Building and the North Western Polytechnic School of Librarianship, was strengthened by additional funds from MPBW which enabled it to enlarge its research team. The team has conducted a thorough review of the terminology of the industry and the way in which concepts have been grouped by a number of classification schemes and thesauri and is currently engaged in establishing the framework for a vocabulary which it is hoped will be completed by the end of this year. In accord with the MPBW policy, it is important that this project should tie in as much as possible with similar work and to this end the principal research officer, in addition to other liaison work, is assisting a study team looking into classification categories.

Classification categories

The main report suggested that there were eleven main categories that would be needed as part of an industry information system:

Building type
Functional spaces
Functional systems
Building element
Technical solutions
Commodity
Construction method
Work sections
Work element
Operative occupations
Plant and equipment

A study team has been set up, with representatives of the main sectors of the industry, to consider these proposals. So far the team has had five meetings and visited a number of organizations with operating systems. Its work requires it to examine the differing processes of the industry and the requirements which these generate for classifications. In addition to examining the need for the recommended categories the team is investigating the structure and relationship of a number of fundamental categories from which other 'operational' categories can be derived. The main difficulty experienced by the team is the need to adopt an abstract approach which, nevertheless, should have observable practical results. Optimally, the classification structure should satisfy several groups of users and several purposes. The team is aiming to present its final report to the Working Party in July this year.

Conventions

This is a particularly difficult area to define and one which was recognized but not closely defined by the main report. Conventions were stated to be 'the codification of practice for convenience and to provide the precision essential for better communications'. In broad terms a convention may be viewed as an agreement between two or more people where roughly equal alternatives exist, and examples of such agreements will include contracts, some standards, glossaries, classification schemes, abbreviations (including symbols), forms and units of measurement. The first stage of a project has been completed which has looked at one clear but important aspect of convention, that of graphic symbols for use in drawings. A large architects' practice undertook a survey with particular reference to the use of British Standard 1192:1969 on Building Drawing Practice, and recommended that MPBW should, in consultation with BSI, undertake further work aimed at resolving the various conflicts found to exist between symbols, redraft the standard and promote its use by the industry. The MPBW team has started a deeper investigation of conventions on a wider front which will allow the identification of areas of work with the most likely payoffs. Work on conventions will include a study of the structure, the format and the cross-referencing of project documents; while work on contracts and methods of measurement is already being undertaken by various bodies in the industry.

Central commodity file

This file is seen as a central store of information about commodities—materials, products and components. It could contain commodity information by identification, composition, method of manufacture, properties, shape, dimensions, weight, applications, distributions, prices and cost and accountancy procedures. As a first step a firm of consulting engineers is undertaking a survey to assess the need for the provision of commodity information. Some 200 firms and organizations in the industry are being approached to identify their commodity information requirements, and the services which are currently providing the industry with this information are being examined. If the first stage of the work establishes the need, later stages will determine the technical and commercial feasibililty of the proposal.

Procedures

The establishment of standard procedures will reduce the demands for a variety of different information forms, but this must not be allowed to stultify development. It is hoped that sets of related procedures can be developed such as GENESYS (Generalized System for Structural Engineering), a master program that will make use of existing programs for structural design and whose main feature is that it can accommodate new programs as they become available. The Ministry's Data Co-ordination Group is to undertake a survey of procedures.

Codes

Work on codes is being carried out independently by many bodies. MPBW is keeping in touch with developments and through a Study Team set up by the Working Party has made proposals for a commodity identification code similar to the Standard Book Numbering system used by publishers. The code will assist those involved in business transactions concerning commodities and the National Federation of Builders' and Plumbers' Merchants intend to use it as part of a computer-based service being developed for members. An important feature of the code is that it is compatible with the National Computing Centre's own proposals for a national commodity code.

In addition to these areas of study it will be necessary to establish measurable criteria for the evaluation of information systems and to review the machinery of the systems which handle General Documentation. It is hoped that all these studies will be completed, and some of the conclusions implemented by March 1971. This will be a considerable achievement in an industry which has sometimes been unjustly criticized as being conservative and backward.

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Letters to the Editor

Dear Sir,

THE METHOD OF INDUCTION AND SCIENTIFIC RESEARCH

The thoughtful and stimulating paper by Mr L. J. Anthony on *Purpose in Co-operation* (*Aslib Proceedings,* November, 1969, p. 454–66) contained, for me, one jarring paragraph. In this paragraph Mr Anthony describes the scientific method as practised in *the physical sciences and applied in documentation*: 'In general, the emphasis has been on research and investigation in order, first of all, *to amass data* . . . This, of course, is *the scientific method* . . .' (my italics). I fully agree with Mr Anthony that in documentation and librarianship there has been a futile amassing of data on an enormous scale—all done in the name of 'research'. But I disagree with his description of the scientific method as used in the physical sciences.

The method Mr Anthony has outlined is the Method of Induction formulated by Sir Francis Bacon as a development of Aristotle's work on the same topic. Some of the founders of the Royal Society (1662) also equated the method of induction with the method of science but Sir Isaac Newton was only one of the scientists of the 17th century who demonstrated that the new science applied other methods in practice.

Until quite recently, philosophers have continued to equate the method of induction with the method of science. The method of induction permeates everyday life and so is of practical importance. Its study has intrigued philosophers for over two thousand years and has generated its own philosophical problems, e.g. how can the use of the method of induction be justified? by the method of induction?? But for three hundred years hard-headed scientists of all persuasions have used quite other methods and have dismissed (as they still do) the prescriptions of their philosophical colleagues as irrelevant metaphysics.

Unfortunately, the method of induction still seems to be taught as *the* method of science in many schools of librarianship. The dismal effects of this teaching are made evident not only by the piles of futile published data but by the absence of any coherent theory in information 'science'. The methods recently adopted by social scientists, and approved by Mr Anthony, are precisely the methods that physical scientists have been using for three hundred years.

I agree with Mr Anthony that research is likely to become of increasing importance in documentation and librarianship. It is therefore important to correct any remaining impression that data collecting *per se* is of any scientific relevance whatever. The data available for collection are inexhaustible and their continued collection in the name of research merely postpones *sine die* the hard work of thinking that scientific research demands. Is it not still commonly believed that a research project should begin by the amassing of a comprehensive bibliography or a 'look-and-see' survey?

This is not the place to expound the method of science as it is now understood. But if scientific method *has* to be taught in library schools (it is odd that physical research scientists do not have to be taught the scientific method explicitly) those concerned with teaching it to information scientists should be familiar with at least two 20th century works: Sir Karl Popper's *The Logic of Scientific Discovery* (1954), a rather difficult book, and Sir Peter Medawar's *Induction and Intuition in Scientific Thought* (1969), which is more readable. These books will help to dispel the widespread belief that the amassing of data *is* an essential part of the scientific method.

Yours faithfully,
B. C. BROOKES
Director

School of Library, Archive and Information Studies,
University College London,
Gower Street,
London WC1.
16th February 1970

Dear Sir,

I should like to request the courtesy of your columns, in common with those of several other periodicals which have a similar readership, to invite anyone to write to me who agrees that there is a need to discuss some of the following:

All these labels—Curator, Keeper, Librarian, Documentalist, Information Scientist—what do they really mean? What motivates their holders? How have they come to follow their occupations? Can there be a vocation in these areas? Can there *really* be a profession (or professions)? Why do books on information theory and on management rarely mention libraries and information services? What are the psychological characteristics of the label-bearers and of those who are affected by their activities? Can a philosophy, even an ethic, be identified to which most of them may subscribe? In sum, *what's it all about*?

I think that such discussion could be both interesting and useful. It could best take place on neutral ground and without the personality pressures of face-to-face confrontation. I should therefore like anyone who is interested to write to me. I undertake to reproduce and distribute *all* such communications, as little edited as possible, to everyone who writes, and to continue to do so periodically, not less frequently than once a quarter, as long as contributions continue. I should prefer to act rather as disseminator than as editor and should try hard to keep my own observations brief and few. There would be no subscription and no payment for contributions unless experience proved them desirable. Correspondents would be invited to ask for extra copies for their friends.

Yours faithfully,
A. E. STANDLEY

10, Saxon Close,
Runwell,
Wickford,
Essex.
1st February 1970

CURRENT AWARENESS LIST

Recent additions to the Aslib library catalogue are broken down into twelve broad groups, whose coverage is indicated below. These groups are not mutually exclusive but it is hoped that users will find them helpful in scanning for new items of interest.

Note: These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory.

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres; management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

ELIZABETH MACK
Head of Library and
Information Services

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IAN F. FINLAY, M.A., F.I.L., F.R.S.A.

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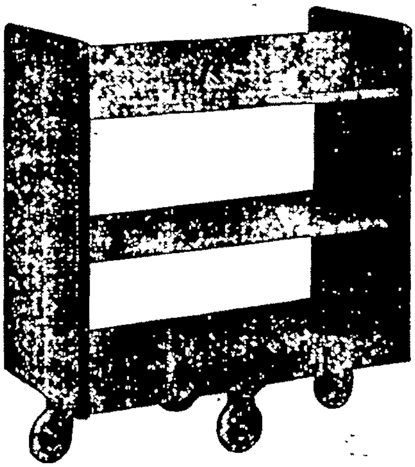

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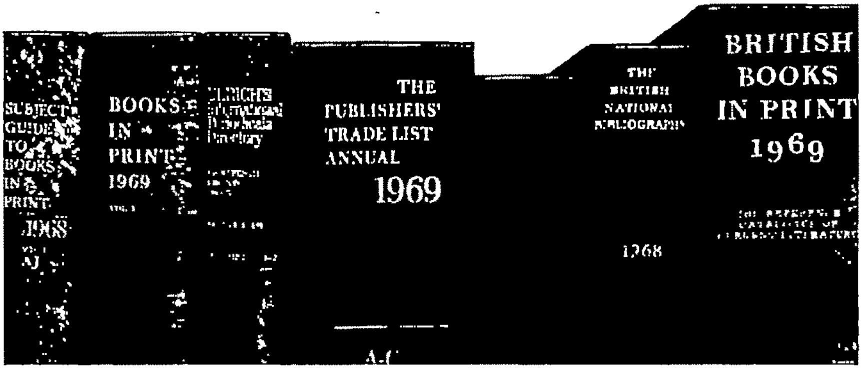

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ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 22 May 1970 **Number 5**

ASLIB CALENDAR 1970

June

TUE. 2.	Aslib Open Day. 3–6 p.m.
WED. 3.	Aslib Annual General Meeting. 11.15 a.m. Open Day. 3–6 p.m.
FRI. 5.	Aslib Technical Translation Group. French sentence competition. Aslib. 3 p.m.
	Aslib Engineering Group One-day Conference: Facets of engineering librarianship. National Engineering Laboratory, East Kilbride.
WED. 10.	One-day Conference on International Developments in Scientific Information Services. Royal Society, London.
FRI. 12 – SUN. 14.	Aslib Electronics Group Annual General Meeting and Conference. Overcliff Hotel, Westcliff-on-Sea.
THU. 18.	Aslib Economics Group Annual General Meeting and Lunch. Criterion Restaurant, W1. 12 noon.
SAT. 20.	Aslib Transport Group Summer Outing: National Maritime Museum, Greenwich, 11.15 a.m.
TUE. 30.	Aslib Co-ordinate Indexing Group. One-day symposium. Engineering and Building Centre, Birmingham. 10 a.m.

July

WED. 1.	Aslib Economics Group. Visit to City Business Library, EC2. 5.45 p.m.

September

MON. 21 – WED. 23.	Aslib 44th Annual Conference, University of Aberdeen.

October

TUE. 20.	Aslib Computer Applications Group Circulation Working Party. One-day symposium: 'Computer-aided systems'. Aslib.
WED. 21.	Aslib/Institute of Information Scientists Joint Evening Meeting. 'OR man looks at IR' by W. T. Bane (IPC New Enterprises). Aslib. 5 p.m.

Annual General Meeting

The attention of members is drawn to the fact that the Annual General Meeting of Aslib will be held on Wednesday 3rd June 1970. All details of arrangements and the Agenda and Annual Report for 1969 have been circulated separately.

Midlands Branch

The 19th Annual General Meeting of the Midlands Branch recently took place at the Arden Hotel, Birmingham when the following officers and members of Committee were elected:

Chairman:	Miss M. Y. Scott (IMI Ltd)
Vice-Chairman:	A. Nicholls (Birmingham University)
Hon. Treasurer:	Mrs M. J. Pennells (Ergonomics Infn. Centre)
Hon. Secretary:	B. W. Gamston (GKN Ltd)
Members:	J. L. Atkins (Coventry City Libraries) A. T. Jones (BIP Chemicals Ltd) D. Keevil (Aluminium Federation) R. N. Lock (School of Librarianship, Birmingham) B. S. Nuttall (BPB Industries Ltd) D. A. Parish (GKN Ltd) J. H. Seals (University of Aston) Miss J. Young (Courtaulds Ltd) D. P. Woodworth (School of Librarianship, Loughborough)

After the business session Dr D. J. Campbell gave a talk on 'Unco-operation by, and between, librarians and information scientists' which followed on from the talk published in the December issue of *Aslib Proceedings*. (It is hoped to publish this second part in a forthcoming issue of the *Proceedings*.) After the talk the members enjoyed a light buffet.

The attendance of the Director, Mr Leslie Wilson, was greatly appreciated.

Co-ordinate Indexing Group

A one-day seminar on co-ordinate indexing will be held at the Engineering and Building Centre, Broad Street, Birmingham 1 on Tuesday 30th June. The first session will commence at 10.45 a.m.

The seminar will have two themes: the desirability of structure within systems, and hardware. Speakers and topics are as follows: Mr A. G. A. Pickford of the Medical Research Council on 'The problems of using an unstructured information retrieval language in a co-ordinate indexing language'; Mr J. Blagden of the British Institute of Management on 'Structured vocabulary with particular reference to management documentation'; Mr J. L. Jolley on 'Co-ordinate indexing embodied in non-computer systems'; and Miss Helen Townley of Wellcome Research Laboratories on 'Co-ordinate indexing in computer systems'.

The cost of the seminar will be three guineas. Further details may be obtained from Mr K. P. Jones, NRPRA, 56 Tewin Road, Welwyn Garden City, Herts.

Aslib and *Biological Abstracts Previews*

Last year Biosciences Information Service (BIOSIS), the American organization responsible for *Biological Abstracts*, announced a new magnetic-tape alerting service *BA-Previews*. This service will provide full bibliographic details for over 220,000 items of literature each year, i.e. all items in *Biological Abstracts* and its sister publication *BioResearch Index*.

OSTI has been offered a year's free supply of these tapes for use in the UK and has awarded grants of £14,048 and £5,650 to the Universities of Oxford and Nottingham for a two year investigation of the use of these tapes. The results should provide a basis for deciding whether an operational SDI service based on *BA-Previews* should be set up for users of biological information in this country.

In offering these grants OSTI has been advised by the Committee on Biological Information, which consists of nominees of Aslib, the Biological Council and the Institute of Biology. Members of the Committee representing all three bodies have been invited to join a project advisory committee. The Aslib representative on the committee will be Miss P. I. Edwards, Chairman of the Aslib Biological Group.

Library & Information Science Abstracts (LISA)

The Publications Committee of the Library Association has formed a Sub-Committee to investigate all aspects of the subject arrangement in *LISA*. The Sub-Committee's composition reflects the interests of users, the Classification Research Group, Aslib and the Library Association. At a preliminary meeting, held on 4th March, alternatives to the present arrangement were discussed. Further meetings are to be held later this year and it is is hoped to present recommendations to the LA Publications Committee by October. It would help the work of the Sub-Committee if the views of more users were known. Comments should be sent to Tom Edwards, Editor, Library & Information Science Abstracts, The Library Association, 7 Ridgmount Street, Store Street, London, WC1E 7AE.

Anglo-American cataloguing rules amendment bulletin

The Library Association has announced the establishment of a new service, the *Anglo-American cataloguing rules amendment bulletin*, which will publish all additions and changes to the Anglo-American Cataloguing Rules (British Text) in a form suitable for precise and detailed amendments to be carried out in copies of the full British Text. The *Bulletin* will also publish summarized information about amendments to the North American Text, especially indicating divergences between this and the British Text. (The principal medium for publication of detailed changes in the North American Text will continue to be the Library of Congress Processing Department's *Cataloging service bulletin*.)

The first issue of the *Bulletin* is now available from the Publications Manager, The Library Association, 7 Ridgmount Street, Store Street, London WC1E 7AE. No charge is made for copies of the *Bulletin*, and applicants for the first issue will be placed on the mailing list to receive subsequent issues as they are published.

Postgraduate awards in librarianship and information science

The Department of Education and Science's Libraries and Information Systems Branch has now assumed responsibility for all postgraduate awards from public funds in librarianship and information science. These consist of:

(a) Information science studentships at present tenable on MSc courses in information science (City and Sheffield Universities).
(b) Library studentships at present tenable on MA courses in librarianship.
(c) Bursaries at present tenable on university courses leading to a university postgraduate diploma or on courses following the Library Association's postgraduate syllabus.

Responsibility for information science studentships has been transferred from the Science Research Council (SRC). SRC standards and procedures will be applied; full details can be found in *SRC Studentships and Fellowships 1969* which is obtainable free from SRC or is available for consultation in universities. Intending applicants should as a first step consult Mr J. E. L. Farradane, at the City University or Professor W. L. Saunders at Sheffield University.

Students who are normally resident in England and Wales and who wish to apply for a library studentship to follow a postgraduate course in librarianship leading to a higher degree should consult the heads of the departments concerned; regulations governing state studentships given in the free DES pamphlet *Grants to Students* 4 will apply to these awards. Those wishing to apply for bursaries tenable on other postgraduate courses in librarianship and information work should do likewise; details of these awards are given in the free DES pamphlet *Grants to Students* 3.

The Department has set up an Advisory Committee which has already met and advised on the allocation of postgraduate awards to library schools. The Committee is as follows:

Chairman: F. W. Jessup (Chairman, Library Advisory Council (England) and Secretary to the Delegacy for Extra-mural Studies, Oxford University).

Members: T. M. Aitchison (Chairman of Council, Institute of Information Scientists and Manager, information research, INSPEC); W. Caldwell (Chairman of the Association of British Library Schools and Head of Library School, Newcastle Polytechnic); H. H. Goom (Information Officer, Guest, Keen and Nettlefold, Wolverhampton); W. R. Maidment (Chief Librarian, Borough of Camden); D. T. Richnell (Goldsmith's Librarian, University of London).

The Department has also accepted the Committee's recommendation that in future all new courses will need to be formally accepted, following the practice of SRC, before studentships or bursaries are tenable on them.

Scottish Summer School of Librarianship

The Scottish Library Association is holding its Annual Summer School at Newbattle Abbey College, near Edinburgh, from 4th to 10th July 1970.

The programme this year includes sessions on In-service training; library planning and building, the library and the student reader; technical library services; and the future of local government and libraries. Among the twenty-four speakers will be the Presidents of the Library Association and the Scottish

Library Association, R. J. Edwards, P. Pocklington, K. Stockham, E. R. S. Fifoot, A. G. Mackenzie, R. S. Walker, and W. Caldwell.

The fee for the School is £15. Bookings should be sent to Mr A. G. D. White, ALA, Blackhall Library, Hillhouse Road, Edinburgh EH4 5EG (031-336 3277), by 30th May 1970.

Course on book-indexing

The Society of Indexers and the North-Western Polytechnic School of Librarianship have arranged a course on book-indexing, to be held at the NWP School of Librarianship from 29th June to 2nd July, inclusive.

Lectures, discussions and practical work will be held on name and subject headings, indexing books in the humanities, sciences and technology and indexing periodicals. A question and answer session will conclude the course.

The fee is 5 gns and closing date for applications is 8th June. These should be sent to Mr L. M. Harrod, c/o North-Western Polytechnic, School of Librarianship, 207–225 Essex Road, London N1.

Librarians' Conference in Aberystwyth

The College of Librarianship Wales and the University College of Wales, Aberystwyth, were hosts to the Annual Spring Seminar of the Cataloguing and Indexing Group of the Library Association held from 10th to 13th April in Pantycelyn Hall. Over a hundred librarians from all parts of Britain and some from overseas spent the weekend hearing about new developments and ideas in the subject indexing of information. Among the guests of honour at the opening Conference Dinner were Professor R. I. Aaron, Chairman of the Library Advisory Council for Wales, Mr Glyn Lewis Jones, Deputy County Librarian, and Mr Denis Grogan, Acting Principal of the College of Librarianship Wales. Mr David Batty, Head of the Department of Information Retrieval Studies in the College of Librarianship, is Vice-Chairman of the Group. Further information about the Conference may be obtained from Mr Batty at the College of Librarianship Wales, Aberystwyth (Tel: Aberystwyth 3842).

British Computer Society

The Information Retrieval Group of the British Computer Society have arranged two meetings for June and July. On Friday 12th June, Dr A. Fox of the Royal Radar Establishment will give a talk entitled 'Grammar can be useful in IR technique'; and on Thursday 9th July, Dr R. F. Churchhouse of the Atlas Computer Laboratory will speak on 'An inexpensive computer based IR system'. All meetings will be held at BCS Headquarters, 29 Portland Place, London W1, at 6.30 p.m.

Journal of the American Society for Information Science

The official journal of the American Society for Information Science, formerly published quarterly and entitled *American Documentation*, has changed its name to the *Journal of the American Society for Information Science* and is now published bi-monthly. Arthur W. Elias, editor of *American Documentation*, will continue as editor of *JASIS*. *JASIS* will continue the *AD* numbering scheme, the first issue

(January/February 1970) being volume 21, number 1. The subscription rate will also remain the same.

MARC II Special Institute

The Information Science and Automation Division of the American Library Association and the Information Systems Office of the Library of Congress will be holding a further MARC II Special Institute on 11th–12th June at Harvard University, Cambridge, Mass. This will be run on the same lines as the Special Institute held in Washington DC in March of this year. (See *Aslib Proceedings*, February 1970, p. 43.) Applications should be sent to MARC II Institute—Cambridge (Mass.), American Library Association, 50, East Huron Street, Chicago, Ill. 60611.

Professor Shigenori Hamada

Professor Shigenori Hamada recently resigned from the presidency of the Japan Center of Science and Technology. During his five years with JICST, Professor Hamada established the Center's own computerized system. He has now taken up the presidency of The Electronics Association of Japan (Toden-kyukan, 1-13, 1 chome, Shimbashi, Minato-ku, Tokyo). The newly appointed president of JICST is Kan-ichi Kodama.

Engineering Production

The first issue of a new fortnightly technical journal, *Engineering Production: the journal of production for profit*, was published on Thursday 12th March. It is edited by Roy Callum, MIED, former editor of *The Engineer* and *Engineering Materials and Design*, and is published by the Engineering, Chemical and Marine Press Limited, 33–39 Bowling Green Lane, London EC1.

BRIEF REVIEWS

AITCHISON, JEAN, *and others*. Thesaurofacet: a thesaurus and faceted classification for engineering and related subjects. Whetstone, English Electric Company, 1969. 491 p. £8.

A new form of indexing language, containing approximately sixteen thousand index terms, which fully integrates a faceted classification and thesaurus. The classification displays the terms in their main hierarchies while the thesaurus lists the same terms together with their secondary relationships, the link being provided by a notation. Thus the two parts are complementary and if used separately, incomplete. The introduction explains philosophy and use.

CODATA. International compendium of numerical data projects: a survey and analysis. Berlin, Springer Verlag, 1969. 295 p. DM 48.

The International Council of Scientific Unions (ICSU) established a Committee on Data for Science and Technology (CODATA) in 1966 to produce and distribute collections of selected numerical data on important substances in physics and chemistry. The headquarters were moved from Washington to Frankfurt/Main in 1968. This directory, prepared mainly in Washington, describes in detail the organization of more than 150 data centres and projects in twenty-six countries, as well as a number of international projects. The arrangement is by six subject groupings: nuclear properties, atomic and molecular systems (including spectra), solid state, thermodynamics, reaction kinetics, and optical properties. Detailed author, subject and country indexes are also provided. There is a very useful chapter on the organizations involved in the international standardization of units, symbols, constants and nomenclature. The publishers hope to produce revisions of the compendium every two years.

HORNE, J. Basic vocabulary of scientific and technological German. Oxford, Pergamon Press, 1969. 334 p. 35*s* paper (SBN 08 011670 1); 50*s* cloth (SBN 08 011671 x).

This dictionary provides a basic amount of scientific and technological vocabulary including pure and applied science, medicine, commerce and industry. It also contains short notes on German compound verbs, word-building and punctuation.

As the production of this book was partially determined by the price and format, it does not claim to contain all the terms and expressions which a user may find in a modern text. Its aim, however, is to offer a practical basic vocabulary for the undergraduate or research student.

INTERNATIONAL CHEMISTRY DIRECTORY 1969–70. New York, Benjamin, 1969. 1111 p. $30 cloth (SBN 8053 0375 8); $10 paper (SBN 8053 0376 6),
and
INTERNATIONAL PHYSICS & ASTRONOMY DIRECTORY 1969–70. New York, Benjamin, 1969. 802 p. $30 cloth (SBN 8053 0377 4); $10 paper (SBN 8053 0378 2).

These are new directories and both are arranged in a similar pattern. The majority of each volume is devoted to a section headed Academic Departments and Faculties: this is a list of research workers specializing in the subject of the directory. The names of universities throughout the world are arranged in one alphabetical sequence of the place or proper name in the title, and the address of the appropriate department is given. The lecturers are listed alphabetically under their university and the details given for each one include year of birth, the university where their postgraduate degree was awarded and their specialized field of interest. There is an index to the names of persons included and an index to the names of universities arranged by country.

The remaining sections of each directory list laboratories in the United States, international and national societies, a small selection of future meetings, grants and fellowships available and major prizes and awards in the subject field, with the name of the latest winner: for each entry brief details are given. The current literature sections cover periodicals, for which the publishers acknowledge that Ulrich's *International periodicals directory* is the main source, and a subject listing of books published since January 1964 for which Bowker's *Subject guide to books in print* was extensively used.

The publishers are preparing similar publications in the fields of mathematics and biology and future editions of all the directories are planned utilizing the computer tape bases made for the first editions. These new publications should prove most useful additional reference tools, in their specialized fields, particularly for the extensive who's who.

JENSEN, HANS. Sign, symbol and script: an account of man's effort to write. 3rd edition. Translated from the German by George Unwin. London, Allen and Unwin, 1970. 613 p. £5 10*s* (SBN 04 400021 9).

This scholarly and excellently produced treatise describes the twelve great script-groups of the world, their origins (brought up to date in terms of recent research in many disciplines), the styles through which they have passed—their rise and fall. The index of scripts contains some 450 entries. With great authority the author summarizes and evaluates the work of generations of experts in this comparatively new field—the scientific study of writing is barely 150 years old. Paradoxically perhaps our involvement in this subject has greatly increased as the computer addresses itself to solving the problems of pattern recognition.

JOURNAL FOR THE HISTORY OF ASTRONOMY. Edited by M. A. Hoskin. Vol. 1, part 1. February 1970. London, Macdonald. £3 per annum (£2 per issue).

This journal is published semi-annually and is devoted to the history of astronomy, astrophysics and cosmology from the early civilizations to the present day. Its subject matter extends to such allied fields as the history of navigation, timekeeping and geography, together with the history of the relevant branches of mathematics and physics.

The main purpose of the journal is to provide a meeting ground for astronomers who are concerned with history but who write mainly for technical journals, and historians of science whose periodicals 'are rarely to be found in an observatory'. There are two main sections: firstly, research articles contributed by astronomers and historians of astronomy from different countries; secondly, an information service 'designed to encourage future research in the history of astronomy'. This information service includes not only reviews of books, but also of catalogues and surveys of manuscript collections, bibliographies of periodical literature, lists of doctoral theses, etc. (This first issue lists University of London theses and dissertations on the history of astronomy.)

MAX-PLANCK GESELLSCHAFT. Zeitschriftenverzeichnis der Max-Planck-Institut: Biologisch-medizinische Sektion, chemisch-physikalisch-technische Sektion. 2te Auflage. München, 1969. 326 p.

This union list of periodical holdings in physics, chemistry, bio-medicine and technology covers libraries in fifty-eight institutes of the Society. It was produced by the Zentralstelle für maschinelle Dokumentation (ZMD) using tape typewriters for the data-processing, and computer-aided typesetting for the printing. The periodicals and serials are arranged in the alphabetical order of the titles and there are altogether 5,686 entries, including references.

NATIONAL SCIENCE LIBRARY. Directory of Canadian scientific and technical periodicals: a guide to currently published titles. 4th edition. Ottawa, 1969. 112 p. $5.

This edition of the directory includes 890 periodicals on science, technology and medicine, which is approximately 350 more titles than in the third edition. As in the earlier editions, the term 'periodical' has been interpreted in its broadest sense to include report series, monograph series, house organs, trade journals, newsletters, annual research reports and other publications issued on a continuing basis.

The periodicals are listed in alphabetical order under broad subject headings and there is an index of titles. For the first time the directory gives an indication of where a particular periodical is abstracted or indexed.

WORLD DIRECTORY OF BOOKSELLERS: an international guide to booksellers. Edited by Alexander P. Wales. London, A. P. Wales, 1970. 912 p. £9 15*s* 6*d*.

This is the first edition of a new directory from A. P. Wales. Its coverage is world wide and the arrangement is alphabetical by countries with booksellers listed under the towns in which they are located.

The name and address of the bookseller is given in each entry and the telephone number and cable address are occasionally shown. Some entries also include a letter and number coding representing the subject and language of the stock held and the type of business, e.g. wholesaler, exporter etc. There is no indication if the shop is a specialist bookseller or a general retailer which also sells goods other than books. There are no indexes.

Correction: In the 'Brief Reviews' section of the February 1970 issue under DEUTSCHE GESELLSCHAFT FUR DOKUMENTATION the price of the bibliography *German language literature on documentation* was given as DM 290. This should have read DM 2.90. We apologize for this error.

THE LIGHT OF KNOWLEDGE
NEW LAMPS FOR OLD

The Fourth Aslib Annual Lecture

delivered by

PROFESSOR J. M. ZIMAN, FRS

Professor of Theoretical Physics, University of Bristol

CHAIRMAN: PROFESSOR SIR HAROLD THOMPSON, CBE, FRS

Senate House, University of London, 22nd April 1970

IT IS impertinent, as a mere consumer, to be addressing a gathering of professional experts in the communications industry. I feel rather like a housewife being invited to speak to a group of electrical engineers, or to a conference of managers of municipal water supplies, about the product that she expects to flow when she presses the switch or turns on the tap. We just want good clean information, at a standard voltage, well filtered, safely insulated, and ready for use: that is all there should be to it.

But of course this metaphor breaks down—we scientists are as much the producers of knowledge, as the users. At the risk of being indelicate, I might equally well regard you as sewage disposal experts: there are moments when the fashionable phrase 'pollution of the environment' seems an appropriate epithet for the vast quantities of waste words that flow out of the scientific community and require to be filtered and purified before the information they contain can be put to use!

At last year's meeting of the British Association at Exeter,[1] I tried to give an account of the communication system of science, and to explain its rationale as a social organization. So much has been preached and prophesied against our conventional system that it seemed useful to make explicit the function that it is designed to serve and the reasons for some of its peculiar features, before we decide to take it all to pieces and build a far far better world. Even if one does not believe that All is for the Best, that the *ancien régime* must at all costs be defended, that More means Worse, and so on, it is a good exercise to put oneself into the shoes of the conservative or reactionary, and to play the advocate in his cause.

My client this evening is a somewhat different character—younger, less stable of purpose, more at the mercy of his emotions, lacking in worldly experience, but full of energy and zeal. I propose to think aloud on behalf of the scientist of the future. What sort of information system will he devise, instinctively, to suit his needs? Since we know nothing for sure about this hypothetical person, this lecture is pure speculation; but science fiction may be as effective as history in the spinning of fables and the manufacture of myths. After all, the transformation of society by science is quite as magical as any of the feats of the Djinn of Aladdin's Lamp.

The conventional system

First let me draw attention to three characteristics of the orthodox system of scientific communication, as we may find in it in the learned journals, treatises, and handbooks that line the bookstacks of your great libraries. The primary function of an ordinary scientific paper is to bring into the public domain an explicit account of some new scientific development or discovery. It is a rather contrived document, very conventional in form and style, whose purpose is to persuade the general scientific community that the author's new observations or arguments are of interest, significance and permanent validity. As I have argued at length in a recent book,[2] the whole activity of science is dependent upon the publication of such documents, and their subsequent criticism, re-evaluation, and eventual acceptance or rejection as parts of the consensus of 'Public Knowledge'.

But scientific publication also plays an essential role in the social system of science as the registration of priority of discovery. Some sociologists of science, influenced by current fashions in anthropological theory, go so far as to describe published papers as the 'gifts' brought by the research worker to his community, for which he is rewarded by recognition and esteem.[3] This interpretation exalts to a somewhat mystical plane our hard-headed practice: in the agony of choosing between worthy applicants for academic posts, we look carefully at the publications of the candidates, in the hope of distinguishing therein some more objective measures of intellect and imagination than are vouchsafed to us by the character references of their previous employers. In other words, since research is the production of new, useful, 'consensible' knowledge, the original papers of a research worker are the tangible evidence of his ability to do research. Surely, if one were appointing a potter to make beautiful pots, then one would inspect the pots he had already made, in the hope of finding them to one's liking.

Finally, I would draw attention to a uniform characteristic of the whole conventional system: the *user* of the information pays all the costs of publication. Books and journals are published by learned societies and commercial organizations, and sold for profit—or at least to cover all the printing costs—to individual research workers or to the organizations for which they work. The library is a co-operative of *readers*, not of authors. This is a point of some principle for it is the ultimate source of the power of the scientific editor or referee; he may reject a contribution on the grounds that it will lower the standard of his journal, or monograph series, and hence endanger its financial viability. As I have argued at length,[1,2] the function of the referee is essential if the scientific literature is to be kept free of crankiness, irrelevance, and gross incompetence. A scientific library, also, is selective in its choice because it must keep within its budget, so that one can feel confident that the books one turns to for reference are the most reliable available, within the judgement of the librarian and his technical advisers.

The crisis of over-population

This conventional system, however well it has worked in the past, is now in a state of crisis. This crisis is not, I would submit, an internal development of the system, but is due mainly to the enormous expansion of scientific activity in the past few decades, putting too heavy a burden on organizations and procedures designed for a more leisurely age. It is not necessary for me to quote figures for this expansion of science, nor to flash on to the screen one of those startling graphs, drawn on a logarithmic scale, showing that if the present rate of growth were to continue unchecked, then by the year 2500 every man, woman, and child on earth would be doing nuclear orientation experiments, or contributing papers on algebraic topology, or all simply tapping away at the teleprinters in the effort to keep up with the computerized indexing of the abstracts of the papers that would by then be pouring off the presses like Niagara Falls. If you do not have this piece of general information firmly in your minds by now, then you have no right to be present at this lecture.

Let us look at this crisis from three different aspects. Much of the discussion has concentrated on the difficulties of indexing, abstracting, and assimilating the vast quantity of new material, proliferating from many breeding grounds and overrunning the poor scientist who is just trying to keep up with the literature. This seems to me to be largely a technical problem that can be solved quite effectively if we are prepared to put sufficient resources into it. It is not obvious, to my mind, that a 'technological fix' with arrays of half-witted computers is the only answer: there is still plenty of scope for development in the oldfashioned procedures of compiling, indexing and printing up-to-date collections of abstracts and reviews. In any case, this is the sort of subject where the consumer has no rights: I leave all that to the expert designers of generators and turbines, dams and pumping stations.

From my point of view, a more intractable consequence of the expansion of science is the debasement of the criteria for quality of publication. Not only is there too much scientific work being published; there is *much* too much of it. I do not wish to argue, at this stage, that the scientific potential of the new generation of research workers is significantly lower than in the past, but simply that the need to get recognition by publication forces each of us to shout a little longer and louder so as to be noticed at all in the gathering, swelling crowd of voices. If we cannot get into the quality journals, we send our pitiful contributions to a second rate publication, produced perhaps by a commercial publisher who has learned that vanity will get him a distinguished-looking list of editors and the professional zeal of librarians will ensure that he gets his money back. Or we may simply have our work printed, or duplicated, as a 'Technical Report' or (hopefully) as a 'Pre-print', and send it round free to everybody who we think ought to be interested. The effect is that the referee system is being eroded at the edges: however hard we try as editors to keep up the standards in the central, well-established, respectable, archival literature, we find ourselves on an island in a vast sea of semi-literate, semi-scientific, half-baked and trivial material, which threatens to swamp the whole system.

Another serious consequence of the expansion of science is a steep rise in the cost of our information services. If we conceive of an information system as a network of pathways from individual to individual then N individuals generate $\frac{1}{2}N(N-1)$ separate channels of communication. Thus, as N increases, the number of channels required by each individual also increases. If the bulk of literature in his subject is growing, then it costs him more to purchase all the journals and books he needs, whether from his private purse or through an institutional library. For the individual scientist these costs can be kept down by narrowing his attention, and only purchasing material within his own specific field: for example, instead of taking the whole of the *Physical Review* or *Proceedings of the Physical Society*, he may now buy only the sections devoted to Elementary Particles, or Nuclear Physics or Magnetism. But for institutions such as universities, this economy is not available, and scientific library costs are really beginning to hurt. In Western Europe and other rich countries, this extra burden can be carried; but for many developing countries, and especially those states with pathological objections to the expenditure of foreign exchange, scientific progress is now hobbled almost to a standstill by the inability to buy the full range of publications that now contain the modern stock of scientific knowledge.

Indeed, the attempt to solve the information crisis by computerized retrieval aggravates the position of a university or research institute in India, Africa, or Latin America, for whom these gadgets are much too expensive. I do not know whether anyone has actually calculated the cost of such devices per research worker using them, but it would be tragic if they came to seem indispensable. The disadvantages of the humble scholar in Chittagong, Cape Coast, or Bela Horizonte are desperate enough, by way of inadequate apparatus, and intellectual isolation, without adding this further cause for feelings of hopeless inferiority and poverty.

The industrialization of science

It is my impression, however, that discussion of the information crisis has seldom been accompanied by a recognition of the rapid structural changes that are taking place within the scientific community which the communication network is supposed to serve. The tacit assumption of the librarian, journal editor, information officer or scientific publisher is that he will always be dealing with the products and needs of a vast horde of individuals—that he is a broker in a peasant market, where pigs and sacks of corn, cart wheels and chairs, are traded from hand to hand, for cash or barter.

It is obvious, however, that scientific research is rapidly evolving from a cottage industry to a system of factory production. This, surely, is an inevitable consequence (if not, also, a cause) of the enormous expansion of science in recent years. If an agrarian population were to grow tenfold in a working lifetime, it could not be accommodated by scattering ten times as many little huts and allotments over the same fields; towns and cities, tenement buildings and office blocks, supermarkets, railway stations, government secretariats, and other appurtenances of high civilization would have to appear. Is this not the appropriate simile for those vast hives of scientific buzzing and honeymaking that we now observe throughout the world, those national laboratories, research institutions, institutes for atomic energy, or for cancer research, or for apple growing, or for seaweed, or for noise, or for space, or for higher thoughts, or for lower temperatures, or for advanced studies, or for retarded minds, or whatever it is. What are they but *factories* for the production of knowledge? Compared with Brookhaven, or CERN, the Cavendish Laboratory of J. J. Thomson and Ernest Rutherford was as a blacksmith's shop to a steel mill. Faraday and Edison, Pasteur and Darwin—they were individual artists or artisans, with perhaps a few apprentices as extra hands; their successors are executives, captains of industry, directors of research, managers of departments, chairmen of research councils, and other high-powered bureaucrats.

There is not the time here to analyse this development. To some extent it flows from the demands of Big Science—the need for the combination of resources and effort around some especially powerful and expensive instrument such as a particle accelerator, telescope, rocket launchpad, nuclear reactor or computer. It is a natural tendency in applied research and development, where vast sums are made available for a concerted attack on some practical problem—a nuclear bomb, radar, a new telephone system, anti-missile missiles—without regard to the extravagance of concentrating too many minds, in too short a time, within such a limited intellectual sphere. There are economies of scale, in the provision of common services such as libraries and computers. There are natural psychological tendencies; many people enjoy the comradeship of others working on the same problems, and are stimulated by the *schwärmerei* of the big buzzing group. There are factors of efficiency and tidiness in the minds of the administrators of government grants, who see virtues in focusing their charitable offerings on the centres of excellence, on the proven scholars with their large and productive groups, rather than spreading a thin layer of bare sustenance over the whole academic community. It can be argued, with a good deal of plausibility, that the relatively modest talents of those nine new scientists in our generation are best employed under the direction of the tenth, who has the inborn ability and imagination for creative research—that only by a division of labour and a team system can we really make scientific progress in reasonable proportion to the numbers of persons involved. Whatever the reasons, good or bad, the fact of industrialization and bureaucratization of science remains.

The consequences of this historical development for the life of the mind have not been seriously discussed; perhaps we cannot discern the effects ourselves, as the wave breaks over our heads. But I would draw attention to two obvious changes in the personal status of the scientist: he becomes more professional, and more subordinate to a team activity.

There have been 'professional' research workers in Western Europe for several centuries—the academicians of St Petersburg and Paris, supported by the State as full-time scholars. Nevertheless, until quite recently, the bulk of scientific research was done by university teachers, not as an explicit part of their employment but as a semi-independent, personally directed activity, motivated by the desire for further preferment as a reward for scholarly prowess. This pressure could be agonizing[4]—witness the bitter struggles of Sigmund Freud to achieve recognition for his discoveries—but it was indirect and unspecific. The official doctrine was that a university lecturer, being called to the vocation of high scholarship, would naturally wish to add to the corpus of pure learning, and was given the freedom to make the best of his time in that way. Within the bureaucratic institutions of our day, this amateur status has been renounced. Whatever freedom he may have in the day-to-day, month-to-month, even year-to-year direction of his research, the modern scientist is none the less paid to be a research worker, and is expected to produce some results of a publishable or useful kind, in return for his stipend. He has not really the option to retire from active scholarly investigations, and to devote himself entirely to teaching, or other duties within the academic community. Like many a Gentleman, he has been handsomely bribed to become a Player.

In the best research institutions, an effort is made to preserve the freedom of the individual scientist in his choice of problem and in the tactics of his research. Nevertheless, the tendency towards team work grows ever stronger. In Big Science,[5] the experiment, and the discovery that arises from it, is not a product of the ingenuity of a single mind, but of a large group, whose members specialize on different aspects—setting up the beam of particles, arranging the counters and spark chambers, designing the electronics, writing the logical programs, checking the overall behaviour of the system, watching the dials as the experiment proceeds, analysing the data, and finally interpreting the results. The evidence for this multiple effort is the multiple authorship of the paper in which the results are reported—a dozen, a score, even half a hundred names appended to the publication. The individual skills required may be of the highest order—but the 'productivity' or 'creativity' of each participant is merged into the collective mind of the team. An investigation that costs a million dollars is clearly a large scale social activity, not at all the same thing as a personal work of art for which credit may be assigned to the individual creator. The war against ignorance is fought by well-drilled companies and battalions, not by heroes in single combat. Success may depend as much upon good staff work, sound logistics, expert training, and skilful command as upon individual courage and skill. The office desk—the *bureau*—takes precedence over the laboratory bench; intelligent and precise execution of orders may be more valuable in subordinates than independence of mind and untrammelled imagination. The very idea of tussling with a problem of natural philosophy may be forgotten in the struggle to achieve some immediate technical aim within the vast framework of the apparatus.

Effects of industrialization on the communication system

Now let us ask ourselves what effect this change in the social and psychological structure of science may have on the information system. It is obvious, in the first place, that there is a grave threat to the convention of awarding promotion, or other forms of recognition, on the strength of published work. The mere fact that a candidate for a lectureship in elementary particle physics has his name amongst the dozens of 'authors' of some significant discovery says little about his scientific skill. In the long run, the leader of such a team gets the credit for its contributions to knowledge, but he must be already the selected and tested boss of a big group. Evidence of ability at a more junior level can only be assessed within the framework of the project itself, just as it would be in an army, a civil service or other bureaucracy. This is not the place to discuss the psychological consequences of this development, which puts direct power into the hands of the seniors, and opens the way to careerism, personal autocracy, and other evils, as well as giving the advantage to the 'other-directed' personality, at the expense of those protestant virtues of being 'inner-directed' which have contributed so much, in the past, to the scientific attitude. All I need to say here is that one of the primary functions of the conventional communication system of science is losing weight. The necessity of maintaining an open market for the creations of the individual scholar, as objective evidence of achievement and promise, is no longer evident.

On the other hand, the funding of research on a vast scale, the assumption that every scientist is a professional, employed and supported materially by a large scale institution, makes it easier to find the money for expensive new techniques of communication. We begin to take it for granted, for example, that we may charge to laboratory overheads our long-distance telephone calls, from Berkeley to Brookhaven, from London to Geneva, from Trieste to Copenhagen, which we would never dream of paying from our private pockets. Air mail for reprints, air travel for conference participants, secretarial assistance, Xerox machines, electric typewriters, photo-offset printing, all are enlisted in the battle for more and more rapid, total, instant, informal communication. It is easy to prove that such aids, although not of negligible absolute cost, pay for themselves many times over within the context of million dollar research budgets, palatial buildings, gargantuan machinery and armies of assistants.

The question that has not been resolved is how this money is best spent in the support of the *formal* communication system. We find, in practice, two divergent trends. On the one hand, the provision of more and more lavish library facilities is taken for granted, along with the new gadgets for information retrieval and search. As I have already remarked, the affluence of science in the more industrialized nations can easily keep pace with the flood of new publications. The assumption is made that library funds will always be increased to permit the purchase of all the new periodicals and books that are relevant to the research on hand, with lavish allowances for treasures that may still be unearthed in the older literature. The recognition that these costs are really trivial by comparison with overall expenditure on buildings, equipment, technical staff and professional salaries was the secret of at least one great fortune in the technical publishing world—and it remains largely true today. Some of us have jibbed at the enormous expense of such marginal aids as the Science Citation Index, and we are worried at the high prices now being charged for advanced treatises and other books, but we can still maintain an open-ended commitment to obtain all the genuine literature of our discipline without making deep inroads into our overall research budgets. Thus, the financial power of bureaucratic science is put at the disposal of the users of information; the larger the scale of the laboratory, the easier it is to provide such facilities on a collective basis.

On the other hand, this financial power is being applied to the information system at the *producer* end. I have already referred to the growth of the 'Report' literature, especially within the very large government agencies and industrial laboratories. This material may not be produced in the full glory of letterpress, but the re-typing and duplicating of a few hundred copies of a 20 page report or pre-print, not to mention air-mail postage and incidental overheads, is not a negligible expense. The fact that it is distributed free—that it is almost forced upon one, like an advertisement for laboratory equipment or life-insurance—is in striking contrast to the high subscription one has to pay to read the same article, only a few months later, in a regular journal. The pressure to get into print, for professional prestige and preferment, is thus diverting a substantial amount of research funds into the information system, but in an extravagant manner that is largely disfunctional to the scientific community, through the degradation of standards and the clogging of the channels by multiple publication of the same basic research.

A parallel development is the rapid growth of the page-charge system. It is an ancient custom for a journal to supply off-prints of an article to its author, at a run-on cost, and this is not begrudged as a service to friends and colleagues who might find it convenient to have a good printed version of the article ready to hand. But this has now been inflated into a really steep charge—$80 per page in the *Physical Review*—levied on the institution of the author when the paper is accepted for publication. It is argued that publication is part of the overall research activity, and therefore its cost should be met out of the research grant, or other fund, that pays the salaries and equipment of the researchers.

This is perfectly logical: but it does conflict with the general principle that publication of scientific information is paid for—hence, eventually controlled in quality—by the reader. The actual pressure behind page charges is the desire of each editor to keep the selling price of his journal within the means of the individual subscriber. This is particularly so for the great scientific societies, whose members have become accustomed to receiving their journals at quite a modest price, as a special concession and a service. I will myself testify that I belong to the American Physical Society, not out of international brotherhood and solidarity, but because I can get a great deal of valuable scientific material—several thousand pages a year—for a subscription of only $50 or so. It is a good bargain, and would be particularly significant if I were working in a developing country where library costs were a real burden.

Nevertheless, page charges become a tax on research, and can only be borne by heavily bureaucratized science, where the employee can assume that somebody else is picking up all the checks. The small research group, still trying to produce in the cottage industry mode, gets squeezed out. Is it really the intention of the American Institute of Physics to prohibit in its journals any publications from the outside, dollar-less world? I certainly do not propose to spend the salary of a good research assistant on having the papers from my own research group published in the *Physical Review*, when I get them printed for free in the corresponding British journal. The AIP say, of course, that the charge is not obligatory: but they are now delaying publication of papers from 'irresponsible' institutions that do not 'honour' their page charges, and have begun to ask higher subscriptions from foreign members on the grounds that we are not paying our fair share of the printing costs. In other words, we are approaching a situation in which the whole scientific community of the United States is regarded as a single body, supported financially and thereby controlled by the major funding agencies of the Government. This support is not a disinterested gift to learning and to humanity, but is evidently calculated as the cost of buying certain specific services for the Nation.

As I have said, I do not propose, in this lecture, to discover conspiracies, nor to denounce the more sinister aspects of the world we live in: in any case, the brutal bureaucratization of science in the Soviet Union and its colonies is far more tragic and foolish than any situation they can manage to bungle their way into, through sheer expediency, in the United States. The significance for the information system is that the institutions that employ the scientists and treat them as a category of skilled manpower, hiring and firing them by hundreds, throwing them into battle as shock troops or keeping them as reinforcements in reserve, counting them as realizable capital assets, as 'Human Reserves' in the balance sheet—these institutions are now laying their hands on the information system, and beginning to take charge of the various mechanisms for the publication of knowledge.

Just at present, we are in a state of transition. The individual scientist—or at least the leader of the research group—is allowed to say what he likes, how he likes, and takes personal responsibility for his research results just as if he were an old-fashioned professor. He may, indeed, have at his disposal the funds to advertise his work through the distribution of reports and pre-prints, without any critical check. On the other hand, he must still submit his results to the scrutiny of independent anonymous referees if he wishes to see them published in a respectable journal. The financial power of the laboratory that employs him is not used to interfere significantly in the form and substance of his published work.

How long can this situation continue? Shall we see, before long, a tightening of the strings within the bureaucratic organization, so that the decision to support publication will rest with higher authorities than the man who really did the research? In a new historical phase where money has suddenly become tighter for research, it seems inevitable that more careful control of page-charge, report, and reprint costs will be exercised, so that only work judged worthy by the senior officers within the institution will be cleared for publication. To anyone familiar with scientific controversy, and the self-righteous malice of the second rate senior scholar found in the wrong, this is an unhappy prospect. The history of Lysenkoism[6] shows the destructive effect of ignorance and incompetence when it gets its hands on the levers of power of a complete bureaucracy, and controls publications as well as employment. We could see a covert conspiracy of the publishing monopolies with the scientific institutions, in which awkwardly critical or uncomfortably heterodox research could get no public hearing.

I am not quite so pessimistic as this. I suspect that the institutions will take firmer control of the publications of their employees, and insist on higher standards of style and of achievement before they will pay the bills. In other words, the published work emanating from a particular laboratory may be seen more and more as a product of that laboratory,[7] rather than as the creation of an individual scientist who only works there. As it becomes more difficult to make a name for oneself by one's personal list of publications, the pressure to put on the market vast quantities of half-baked material may recede, and a longer rhythm of work, with less frequent, less fragmentary papers, may succeed. Of course, there will still be tremendous competition for priority of discovery between groups in different laboratories, but this may well be catered for through the informal system of letters, pre-prints, etc. The actual *number* of papers ceases to be of much significance as a standard of productivity by a substantial institution.

We could arrive at a situation where in practice the role of the referee, as a professional critic, would be performed mainly within the producing laboratories, or even within the research team itself. It must be remembered that the function of the editor of a journal, or of his anonymous referees, is not to guarantee the complete scientific validity of every paper that eventually gets published. One only finds this notion in the minds of certain notoriously hypercritical scholars, who eventually get dropped from the panel of experts! The job of the referee is to confirm that the work is scientifically interesting, more or less original, reasonably well expressed, and not vitiated by obvious errors that the author can be persuaded to acknowledge. It provides a barrier against irrelevance, crankiness and gross incompetence—not against mild stupidity or subtle mistakes. These conditions can be met quite easily by the informed critical examination of work in progress within a capable team or well-established laboratory. No doubt there are occasions when the leader of a research group imposes his personality so strongly on his juniors that he can persuade them to put their names to work that they do not quite believe in—but we also have examples where the name of some famous scholar is sufficient to blind the anonymous referees to the weakness of his argument. In other words, I am prepared to believe that the standard of work published at the behest, and in the name, of a well-established laboratory or other scientific organization might be somewhat higher than the average produced by individuals in the current literature.

Shall we then see a new system, in which the great scientific corporations announce their discoveries in 'house journals', edited internally and distributed for free? In general, such a system would not conflict with the fundamental characterization of science as a community devoted to the creation of 'consensible' knowledge. Given reasonable freedom of speech and action within the corporate institutions, critical comment and the eventual arrival at a rational consensus would still be achieved. The 'scientific attitude' has become so ingrained in the thinking of a generation of professional research workers that even such power structures as Lysenkoism can be defeated by an appeal to simple fact and straight logic.[6]

But it seems absolutely essential for the preservation of this attitude that the bureaucratic corporations should not monopolize the sources of information and means of communication. One single international institute of high energy physics, dominated by its trillion volt machine and controlling all the media of publication in this field, would be a monstrosity. Competition for priority between individuals must be transformed into intellectual controversy between co-equal groups and teams, with public debate and open criticism the major weapons.

It is particularly important that the old-style journals, published at the expense of their readers and preserving high standards through the use of anonymous referees, should not fall for the expedient device of the page-charge. As I have said, there is a danger that the learned societies may fall in with the bureaucratic trend, and fail to protect the rights of those of their members who still have freedom to do research on their own account. Can't you just see it. A paper arrives from a private address. 'Don't know this name. . . . Doesn't seem to be in the directory of Ph.D's. . . . Where does he work? Seems to be doing some desk job in the Patent Office. . . . They don't have a program in astronomy, surely. Has he got permission to publish from his research manager? I bet they won't pay their thousand quid for this stuff. I'll call up the Director: what was the initial; oh yes: A for Albert—O.K. I've got it. Albert Einstein'.

To maintain the older system of scientific communication within the framework of the new bureaucracy and the new technology will not be cheap; to many, it may seem no more than the preservation of a charming traditional custom. The new procedures which I have sketched out will have many advantages, permitting extensive rationalization of the information network, and much easier access to libraries, computerized indexes and other means of information retrieval. Whatever is published by the great laboratories and other corporate bodies may be better written, better printed, more uniformly of scientific interest, and better indexed than anything we have known in the past. For *normal* science—the solving of puzzles within an accepted framework of ideas, by well-organized teams, using expensive apparatus, under the direction of the experienced professionals, this may be the best way to do it. But the mechanisms for revolutionary transformations of thought such as those generated by a Darwin, a Mendel, a Wegener, a Planck, have always been frail, and must be preserved at all costs. I am sorry for the Indonesians and Bolivians, unable to buy all the journals they need to keep themselves scientifically informed, but I do not think it would be to their benefit if the world's scientific literature were given away, like advertisements for patent medicines, yet all doors were then closed to the publication of their own modest researches.

Books, by and for, bureaucrats

I have left to the last the very important problem of reviews and books within the framework of big, corporate science. As I have already suggested, the supposed crisis in technical book publishing, with hard cover or even paperback editions pricing themselves out of the market,[8] is not the real issue: the difficulty is to get them written in the first place. There is already a serious lack of incentive towards review writing, instead of primary research,[1] fostered by a false philosophy of originality and 'creativity'. It is held to be a waste of one's talents (however modest!) to 'take time off from one's research' for the supposed drudgery of this 'derivative activity'. Even within the conventional system, the writing of books and review articles has become intellectually devalued, and no longer regarded as a high art of scholarship, contributing greatly to the furtherance of knowledge and winning laurels of fame for the author.

Of course, the financial rewards are usually quite modest—only those few authors who were cunning enough to fill a gap in the booklist of the half million college freshmen in Sociology I, or European Civilization 001, or even Algebra

1A, have made fortunes in this business. For the ordinary good scientist, with an excellent monograph or treatise waiting to issue forth, there is not a hope of his royalties covering even his normal income for the time spent in writing, let alone all the years of experience and reading that have really gone into it. If scientific books were composed by professional writers, then we should have a depressed class of hacks on our hands, as poor as would-be novelists and infinitely duller. But, of course, most reviews and books are written by people already enjoying a full academic or other institutional income, and the payments they receive for this work are additional 'perks', which help to get the house painted or to buy a sail boat. The marginal financial incentives, generated within the conventional system of cottage-industry science by the thirst of the readers for great draughts of fresh new knowledge, are not negligible, but they are not sufficient to buy the best in authorship.

The bureaucratization of science weights the balance even more heavily against the writing of reviews and books. It is psychologically much more difficult for the member of a team to withdraw himself from active experimentation than it has been, in the past, for the lone individual. Imagine yourself, once more, in a group devoted to high energy physics, or to space research. The experiment has been planned several years previously, as part of a complex continuing program, where many groups must take their turn at the receiving end of the accelerator or satellite. The technique of observation, the design of the apparatus, the testing, proving, and running of the equipment, are all novel, and only marginally reliable. The whole process, spread over many months, is a race against time, against the schedule of use of the beam or rocket, and against rival groups. There are continual crises, and conferences, and unplanned modifications to develop and test. Skilled manpower is in short supply, and everybody is driven on, relentlessly, by the ambition and enthusiasm of the leader of the team. How can one possibly withdraw from such purposive activity, with its clear and immediate goals, just to sit, and think, and write a few hundred words, and scratch it out again, and wander aimlessly round the library seeking inspiration, and go back to the desk, and try again to express with due clarity and simplicity the convoluted thought one has nearly mastered in another man's work. In the busy workaday world of making, mending and doing, this looks like *dolce far niente*, or even treason: 'We've no room for passengers on this craft' says the leader of the team—handing one a monkey-wrench, and indicatating the vacant place around the apparatus where it is to be applied. If one is trained from manhood to work in such a team, one can scarcely abandon one's friends and colleagues in such circumstances.

Indeed, if one is paid full time to do research, then, by golly, research one ought to do. 'Research', in the eyes of most managers and grant givers, is what leads to primary publications—real new discoveries—not this messing about writing books. Thus, even the individual, lone scientist, employed by a university or other institution, may come to feel that he is not really earning his salary if he spends his working time in this apparently unproductive activity. As can readily be shown, by an appeal to the general principle that science is *public* knowledge, necessarily subject to a continuing process of critical assessment and re-integration, the activity of the review writer is quite as important to the scientific community as the making of 'original' discoveries—but the purpose of the bureaucratic research corporation does not extend that far. We face, indeed, one of the familiar paradoxes of society—the 'crisis of the commons'[9]—in which the immediate self-interest of the individual is best served by his adding another goat to the grazing herd, rather than by fencing and controlling the use of the common land. In so far as the individual becomes the paid employee of the purely selfish and soul-less corporation, he loses his liberty to act in an enlightened way in recognition of the needs of the community. In other words, the shallow philosophy of 'getting on with one's work'—that is, piling up research findings—is actively reinforced by the attitudes of management, dominated by quantitative measures of 'productivity' and 'creativity', and not caring at all about the general health of the art.

Review and book writing is thus driven into the 'spare time' of the scholar—evenings, week-ends, and occasional sabbatical leaves. Even in the university it is not considered proper for any scientist except a professional 'theoretician' to spend his ordinary working hours in this way. There could develop a threat to the modest financial rewards to be won by this extra effort—high taxation on additional earnings, or the demand that 'outside' income by holders of academic posts be disclosed and curtailed in the name of equality, fair shares, and maximum productivity. One can just see a certain type of PIB/Treasury character arguing most persuasively that since book writing must constitute a diversion of effort from the Teaching and 'Research' for which each Professor and Lecturer is already paid in full according to his exact merits, the royalties should be counted as a contribution to the funds of the university itself (the corresponding amount to be deducted from the UGC grant, on receipt of full returns countersigned by the Registrar and Vice Chancellor) and not go into the pocket of the employee who happened to undertake this irrelevant but lucrative activity.

Well, we have not quite got to the point yet—though I see no impenetrable barriers against it within the basic axioms and theorems uttered on behalf of most of the corporate bodies in the spheres of government and industry. We must evidently begin a campaign now, before some sort of disaster of fragmentation falls upon the whole system of communication in science. A number of lines of action suggest themselves. The providers of research grants, for example, might consider much more seriously the explicit subsidization of such writing, by providing funds for sabbatical leave that would free a university teacher from his every-day duties for a certain time, not to do more experiments but specifically to write. There have been occasions when the writing of a book has been proposed as the goal of a research project, but from what one hears this is not usually received with favour by the expert advisory committees, who perhaps set much higher standards for what they regard as the essentially mechanical work of surveying what is already known than they do in estimating the likelihood of success of a proposed new investigation. They must be made aware of their own unconscious belief that writing is really much more difficult and dangerous than experimentation (for it exposes the mind and soul to criticism and ridicule) and therefore be lenient and generous towards those who are willing to give it a try.

Within Big Science, it may be necessary to assign the role of 'scribe' or 'theorist at large' to a particular member of the team, or to provide income and facilities for a number of such experts within the institutional framework. Perhaps this is already happening—for example in the enormous space-science corporations and administrations. But notice the danger of specializing and professionalizing this particular role. The knowledge and learning needed to write a book comes only by direct experience at the research front, by participation in the uncertainty of experiment and argumentation. No amount of external reading around a subject can give one the feel of it: a particular field of science is like one of those vast, extended, African or Indian families, into which one must be born, or to which one must be wedded for many years, before one can understand or explain what it is really about. Thus, every research scientist ought, from time to time, to put on for himself the mask of the reviewer, to see his subject whole and express his own wisdom; he cannot leave this essential task to a hired writer, however expert at grammar and syntax. The invitation to assume this persona could as properly come from his research manager or other bureaucratic superior as any instructions concerning research to be undertaken or classes to be taught.

Finally, the new tendency for the cost of the information system to be met by the producer rather than the reader might be allowed to take effect here too. The books written by those employed for that purpose by corporate bodies could be produced cheaply, and heavily subsidized, in the name of scientific progress. If the incentive of royalties and other personal rewards is still to be active, then a substantial subsidy to non-profit publishers might make it much more worthwhile for authors to stop research or teaching for a while. The book-writing world, fiction and non-fiction, has such a pecular economic structure, and seems to defy so many of the theorems of the market place and factory, that one cannot predict just where and how the extra funds would have the best leverage—but it seems to me essential that corporate action be taken to restore to the scientific community as a whole these services that are now threatened.

Optimism is not enough!

In this lecture I seem, once more, to have taken a rather gloomy view of the future. But of course it is the duty of the social commentator to 'view with alarm', and predict catastrophes that might indeed occur if one did not take evasive action: pessimism is as proper to his tone as gravity is to an undertaker or frivolity to a debutante. After all, the worst does not always happen, and we can have pleasant surprises. For all the scale and complexity of its social organization, for all the crimes and follies committed in its name, there is a certain simplicity and purity about science, inherent in the image of the curious man studying the world about him, and finding it interesting, intelligible, and good to look on. In the Tale of Aladdin, the Princess was tricked into exchanging the magic lamp for a new one that would not work. I still have confidence that we shall be able to call the Djinn to our service, nearly as well with our new lamps, as we have with the old one these last three centuries.

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PROBLEMS WITH REPORTS
PARTICULARLY MICROFICHE REPORTS

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National Lending Library for Science and Technology

Paper presented at an Aslib Engineering Group Conference on 'Facets of Engineering Librarianship', Newcastle-upon-Tyne, Wednesday, 4th February 1970

WHEN I was first approached to give this talk I was faced with an immediate dilemma. How does one define reports and worse still how can one define a microfiche report? It can be said that as a general rule reports have an alphanumeric identification code, but this will convey different ideas to different people. Many experts tend to agree that you cannot define a report, but if you see one you can generally recognize it as such. This is probably true as far as full size reports are concerned, but is far more complicated if one has only the micro-images of a microfiche to go by. It is true that generally there is an eye-readable title line, incorporating an alpha-numeric code, but this as a rule will not be sufficient to distinguish a report from a conference paper, from a translation, a patent, or in some cases, even from journal articles. For this reason alone, the parameters of report literature will vary according to individual interpretations.

Having said this, what I propose to do is to describe briefly the various main report series which are available, the indexes and abstracts in which the reports can be located and then discuss some of the problems and pitfalls as well as shortcuts and tricks of the trade, knowledge of which should help you in dealing with report literature. I should like to emphasize that the report literature discussed here is unclassified, unlimited report literature without any security, commercial or other restrictions. Restricted documents of course present many additional problems.

About 80–85 per cent of the world's report literature is of US origin, so perhaps one should deal with these first. A very high proportion of research in the USA is carried out under government contract; thus it is not surprising that various US government agencies are the main input and output points for report literature. The main agencies responsible for this vast flood of reports, most of which are available on microfiche, in many cases *only* on microfiche, are:

1. DDC
2. NASA
3. USAEC
4. CFSTI
5. OE–ERIC (see Appendix for glossary of abbreviations)

It is essential to understand the main functions of these agencies in order to avoid misreading the information given in the abstract journals published by or on behalf of these organizations. So let us look at DDC first.

1. The Defense Documentation Center gathers in all reports produced as a result of contract work of interest to or affecting defence, whatever form these

documents take. On receipt, or sometimes beforehand, they are allocated an AD accession number and it is generally this number, and not that originally given by the issuing body, which will identify the document to the general public. At this stage virtually all the documents are in a hardcopy form; some of them printed, some lithographed or typed, and some of the manuscripts are intended for publication in journals.

The document input is processed initially in hardcopy form and, after security classification, all documents are microfiched and are then made available to DDC staff and its contractors. Microfiche silver masters of the documents cleared by DDC for general use, and DDC is the sole arbiter as to what should be released, are passed to CFSTI who will, after listing the reports in USGRDR, disseminate microfiche, or enlarged copy made from the microfiche, on demand. I will come back later to problems involved in this process. There is one point however which should be made clear: DDC is only accepting requests from its own staff and from their contractors. Valuable time will be saved, if requestors in the UK without contractual arrangement with DDC do not write to DDC for documents. Such requests are passed by DDC unanswered to UKSM who in turn will refer the requestor to the NLL or Mintech.

2. NASA produces STAR mainly for the benefit of their staff and contractors. Similarly, the documents listed in STAR are available to the staff of NASA and its contractors, but not necessarily so to the general public. Here again it is important to know the idiosyncrasies in the abstracts and indexes and it is intended to return to these shortly.

3. In the same way USAEC produces NSA, primarily for the benefit of its staff and its contractors. In this case, however, the demarcation is much more flexible and liberal, because under the UN agreement on the peaceful uses of atomic energy the USAEC maintains a world-wide network of depository libraries of atomic energy reports on microfiche and NSA is the main key to this collection. After this oversimplified comment, I will return a bit later to discuss some of the problems.

4. DDC, NASA and USAEC control a very large amount of research and consequently also a very large number of documents reporting on this research. The same is not true for the other two agencies mentioned. CFSTI—an agency of the US Department of Commerce—is what is says it is. It is a clearinghouse for documents of other organizations and as such indexes, lists, reproduces and disseminates the reports supplied to it by other organizations. The biggest part of the input to the Clearinghouse comes from DDC, NASA, USAEC and the Department of Commerce.

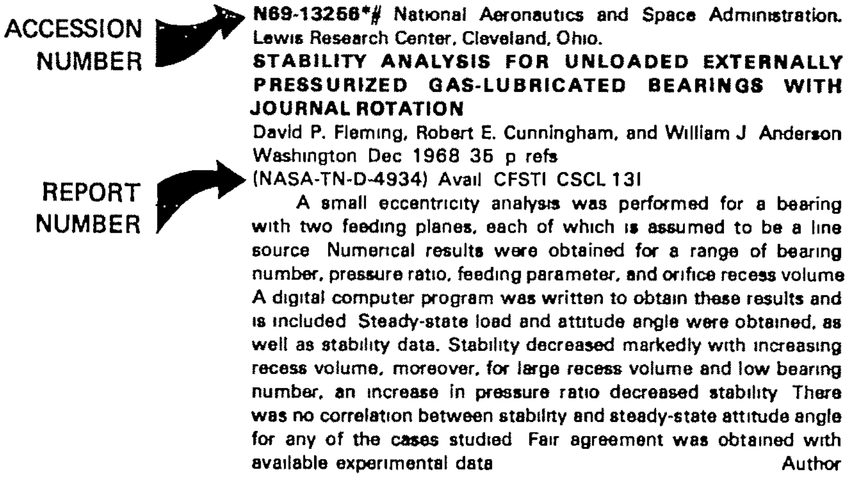
5. A similar type of clearinghouse is operated by the Office of Education. Their Educational Resources Information Center (known as ERIC) acts as a clearinghouse for educational documents. Formal introductions to ERIC will follow later.

The foregoing should give you some information regarding the main disseminators of report literature in the USA and it should be remembered that probably over 90 per cent of reports of US and foreign origin go through the input end of those organizations, even if they do not reach the output point.

Now let us turn to some of the problems encountered with microfiche reports. Perhaps I am oversimplifying this but there are really two types of problems. One is what I would define as the 'real' problem, the other is the result of misinterpreting information given or implied, sometimes very vaguely, in the abstract journals listing the reports.

I am glad to say that most problems arise in the latter group and this means that the problems can be overcome in most instances by correct interpretation of what is stated or implied.

I already mentioned STAR and NSA to which I should promptly add USGRDR and IAA and RIE.


ACCESSION NUMBER
REPORT NUMBER

N69-13256*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STABILITY ANALYSIS FOR UNLOADED EXTERNALLY PRESSURIZED GAS-LUBRICATED BEARINGS WITH JOURNAL ROTATION
David P. Fleming, Robert E. Cunningham, and William J Anderson
Washington Dec 1968 35 p refs
(NASA-TN-D-4934) Avail CFSTI CSCL 13I

A small eccentricity analysis was performed for a bearing with two feeding planes, each of which is assumed to be a line source Numerical results were obtained for a range of bearing number, pressure ratio, feeding parameter, and orifice recess volume A digital computer program was written to obtain these results and is included Steady-state load and attitude angle were obtained, as well as stability data. Stability decreased markedly with increasing recess volume, moreover, for large recess volume and low bearing number, an increase in pressure ratio decreased stability There was no correlation between stability and steady-state attitude angle for any of the cases studied Fair agreement was obtained with available experimental data Author

FIG. 1 Abstract of NASA originated report in STAR

Let us take STAR first. This is published twice a month, with quarterly† and annual indexes. The abstracts are arranged in thirty-four subject categories and there is a subject index, and also a personal author, corporate source, contract number, report number and accession number index. It should be noted that STAR lists not only US reports, but gives a world-wide coverage of aerospace reports. For the benefit of any of you who may not be familiar with STAR I should like to give a few examples of abstracts from this publication.

N69–13256 (Figure 1). This is an abstract without any complications or problems. The letter N indicates its NASA–STAR origin, and '69' refers to the year in which it was announced. The * shows that the report originated within NASA or one of its prime contractors. The # symbol indicates that a microfiche of this document has been prepared. Below the accession number and corporate source the title is given, followed by the name of the author, the publication date if applicable, other details such as contract numbers would be shown next. Then follows the report number, and the CFSTI after the report number indicates that CFSTI has been furnished with a copy and that copies, microfiche and/or hardcopy should be available from CFSTI.

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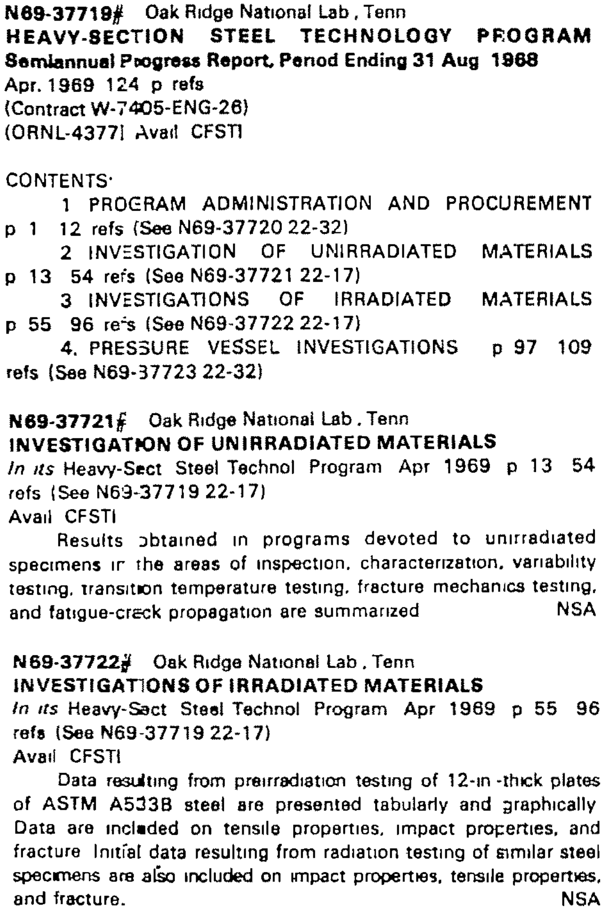
† Since presentation of this paper, it has been announced by NASA that the quarterly indexes are to be discontinued and from 1970 only semi-annual and annual indexes will be published.

For microfiche stock, provided of course that a # symbol is shown, the accession number is the most important number. This is the number which is the eye-legible identification number of the document. For hardcopies, generally the report number is the more important number. However, since it is uncertain in what form the report is held in any library it is advisable to make a note of all the numbers quoted.



N69-37719# Oak Ridge National Lab., Tenn
HEAVY-SECTION STEEL TECHNOLOGY PROGRAM
Semiannual Progress Report, Period Ending 31 Aug 1968
Apr. 1969 124 p refs
(Contract W-7405-ENG-26)
(ORNL-4377) Avail CFSTI

CONTENTS:
1 PROGRAM ADMINISTRATION AND PROCUREMENT p 1 12 refs (See N69-37720 22-32)
2 INVESTIGATION OF UNIRRADIATED MATERIALS p 13 54 refs (See N69-37721 22-17)
3 INVESTIGATIONS OF IRRADIATED MATERIALS p 55 96 refs (See N69-37722 22-17)
4. PRESSURE VESSEL INVESTIGATIONS p 97 109 refs (See N69-37723 22-32)

N69-37721# Oak Ridge National Lab., Tenn
INVESTIGATION OF UNIRRADIATED MATERIALS
In its Heavy-Sect Steel Technol Program Apr 1969 p 13 54 refs (See N69-37719 22-17)
Avail CFSTI

Results obtained in programs devoted to unirradiated specimens in the areas of inspection, characterization, variability testing, transition temperature testing, fracture mechanics testing, and fatigue-crack propagation are summarized NSA

N69-37722# Oak Ridge National Lab., Tenn
INVESTIGATIONS OF IRRADIATED MATERIALS
In its Heavy-Sect Steel Technol Program Apr 1969 p 55 96 refs (See N69-37719 22-17)
Avail CFSTI

Data resulting from preirradiation testing of 12-in.-thick plates of ASTM A533B steel are presented tabularly and graphically Data are included on tensile properties, impact properties, and fracture Initial data resulting from radiation testing of similar steel specimens are also included on impact properties, tensile properties, and fracture. NSA

FIG. 2 Abstract of non-NASA report in STAR also showing method of dealing with individual papers in a large volume

N69-37722 (Figure 2). Two things should be noted here in particular. Quite often STAR will prepare individual abstracts for separate papers in a larger volume. In such cases the term 'In its . . .' is used to lead the reader to the main entry, which is usually also the identification number of the microfiche. In this example the main entry and the microfiche reference will be N69–37719. It should be noted that the report in question is in fact a USAEC report ORNL–4377 listed in NSA (23-24783) and USGRDR (69–17) (Figure 3).

This example is shown to illustrate the point, that not infrequently it can happen that say a NASA report is available through CFSTI only as USAEC report. All sorts of permutations are possible, some of which can be very complex indeed. For example, STAR lists a number of British reports originating from NPL and published through the Aeronautical Research Council. For reasons I do not wish to go into here, some of these reports have not been available, certainly not on microfiche, to the general public from these sources, but could be obtained as microfiche as an AD report or a NASA report. Of course there are many other variations. Are then all the reports listed in STAR available to the public? It should be remembered that STAR abstracts aerospace reports from all countries, US, USSR, UK, Turkey, Japan, etc. Bearing this in mind, availability to the public must be limited for copyright and many other reasons. Attention should be drawn to the information given in STAR for European users, and I quote:

> An extensive collection of NASA and NASA-sponsored publications is maintained by the National Lending Library for Science and Technology, Boston Spa, Yorkshire, England. By virtue of arrangements other than with NASA, the National Lending Library also has available many of the non-NASA publications cited in *STAR*. European requesters may obtain facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the sympols '#' and '*'.

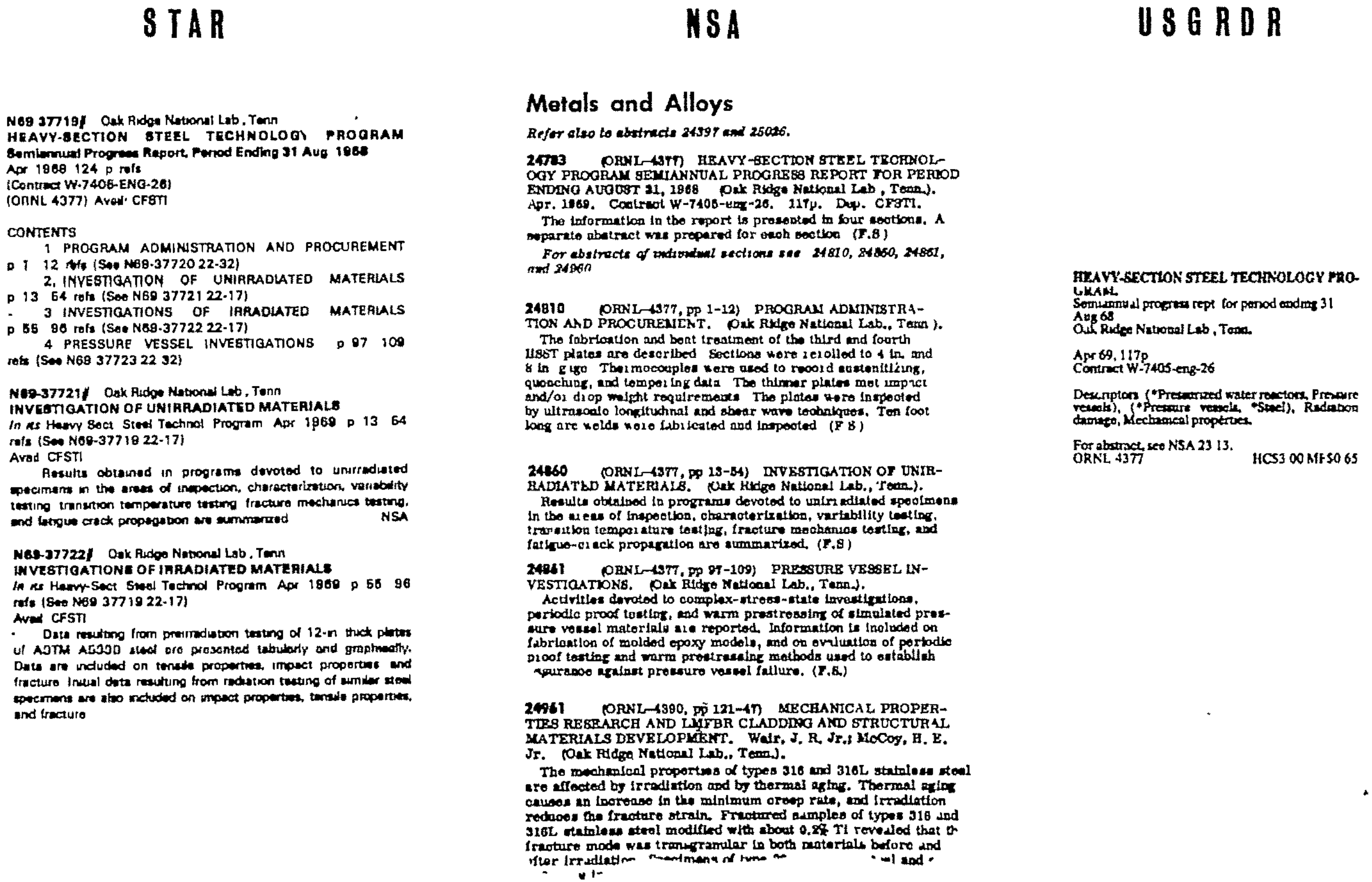
Thus, it is probably true to say that apart from the reports indicated by * and/or # there is available in this country, at the NLL, a collection which includes most items listed in STAR. Reports marked with an asterisk alone and those showing both symbols together, i.e. * and # should also be available as hardcopy and microfiche respectively from the Mintech TRC, who still also hold some of the other reports listed. A new symbol + has just been introduced in STAR to identify those documents that present unusual problems of reproducibility. Documents indicated by a plus (+) sign will not be available on microfiche.

So far I have spoken about STAR. But there are in fact two complementary abstract journals in the aerospace field: STAR and its sister publication IAA prepared and published under a NASA contract by AIAA. The abstracts in STAR cover world-wide report literature relative to space and aeronautics. The abstracts in IAA provide similar coverage of scientific and trade journals, books and more significantly of papers presented at meetings on aerospace research.

STAR and IAA are organized and indexed in basically identical ways and a carefully structured indexing system further facilitates the use of each journal.

Let us turn our attention now to the US Atomic Energy Commission and its main reference tool, Nuclear Science Abstracts (NSA).

The AEC's research and development efforts are conducted almost entirely under contract with AEC-owned but privately operated laboratories, with universities and other non-profit institutions, or with commercial enterprises. The contractors are required to report periodically on the results or progress of



STAR

N69 37719# Oak Ridge National Lab., Tenn
HEAVY-SECTION STEEL TECHNOLOGY PROGRAM
Semiannual Progress Report, Period Ending 31 Aug 1968
Apr 1969 124 p refs
(Contract W-7405-ENG-26)
(ORNL 4377) Avail: CFSTI

CONTENTS
1 PROGRAM ADMINISTRATION AND PROCUREMENT p 1 12 refs (See N69-37720 22-32)
2. INVESTIGATION OF UNIRRADIATED MATERIALS p 13 64 refs (See N69 37721 22-17)
3 INVESTIGATIONS OF IRRADIATED MATERIALS p 55 96 refs (See N69-37722 22-17)
4 PRESSURE VESSEL INVESTIGATIONS p 97 109 refs (See N69 37723 22 32)

N69-37721# Oak Ridge National Lab., Tenn
INVESTIGATION OF UNIRRADIATED MATERIALS
In its Heavy Sect Steel Technol Program Apr 1969 p 13 64 refs (See N69-37719 22-17)
Avail CFSTI

Results obtained in programs devoted to unirradiated specimens in the areas of inspection, characterization, variability testing transition temperature testing fracture mechanics testing, and fatigue crack propagation are summarized NSA

N69-37722# Oak Ridge National Lab., Tenn
INVESTIGATIONS OF IRRADIATED MATERIALS
In its Heavy-Sect Steel Technol Program Apr 1969 p 55 96 refs (See N69 37719 22-17)
Avail CFSTI

Data resulting from preirradiation testing of 12-in thick plates of ASTM A533B steel are presented tabularly and graphically. Data are included on tensile properties, impact properties and fracture Initial data resulting from radiation testing of similar steel specimens are also included on impact properties, tensile properties, and fracture

NSA

Metals and Alloys

Refer also to abstracts 24397 and 25026.

24783 (ORNL-4377) HEAVY-SECTION STEEL TECHNOLOGY PROGRAM SEMIANNUAL PROGRESS REPORT FOR PERIOD ENDING AUGUST 31, 1968 (Oak Ridge National Lab., Tenn.). Apr. 1969. Contract W-7405-eng-26. 117p. Dep. CFSTI.

The information in the report is presented in four sections. A separate abstract was prepared for each section (F.S.)

For abstracts of individual sections see 24810, 24860, 24861, and 24960

24810 (ORNL-4377, pp 1-12) PROGRAM ADMINISTRATION AND PROCUREMENT. (Oak Ridge National Lab., Tenn.).

The fabrication and heat treatment of the third and fourth HSST plates are described Sections were rerolled to 4 in. and 8 in gage Thermocouples were used to record austenitizing, quenching, and tempering data The thinner plates met impact and/or drop weight requirements The plates were inspected by ultrasonic longitudinal and shear wave techniques. Ten foot long arc welds were fabricated and inspected (F S)

24860 (ORNL-4377, pp 13-54) INVESTIGATION OF UNIRRADIATED MATERIALS. (Oak Ridge National Lab., Tenn.).

Results obtained in programs devoted to unirradiated specimens in the areas of inspection, characterization, variability testing, transition temperature testing, fracture mechanics testing, and fatigue-crack propagation are summarized. (F.S)

24861 (ORNL-4377, pp 97-109) PRESSURE VESSEL INVESTIGATIONS. (Oak Ridge National Lab., Tenn.).

Activities devoted to complex-stress-state investigations, periodic proof testing, and warm prestressing of simulated pressure vessel materials are reported. Information is included on fabrication of molded epoxy models, and on evaluation of periodic proof testing and warm prestressing methods used to establish assurance against pressure vessel failure. (F.S.)

24961 (ORNL-4390, pp 121-47) MECHANICAL PROPERTIES RESEARCH AND LMFBR CLADDING AND STRUCTURAL MATERIALS DEVELOPMENT. Weir, J. R. Jr.; McCoy, H. E. Jr. (Oak Ridge National Lab., Tenn.).

The mechanical properties of types 316 and 316L stainless steel are affected by irradiation and by thermal aging. Thermal aging causes an increase in the minimum creep rate, and irradiation reduces the fracture strain. Fractured samples of types 316 and 316L stainless steel modified with about 0.2% Ti revealed that the fracture mode was transgranular in both materials before and after irradiation. Specimens of type [illegible] and [illegible]

USGRDR

HEAVY-SECTION STEEL TECHNOLOGY PROGRAM.
Semiannual progress rept for period ending 31 Aug 68
Oak Ridge National Lab., Tenn.

Apr 69, 117p
Contract W-7405-eng-26

Descriptors (*Pressurized water reactors, Pressure vessels), (*Pressure vessels, *Steel), Radiation damage, Mechanical properties.

For abstract, see NSA 23 13.
ORNL 4377 HC$3 00 MF$0 65

FIG. 3 Different methods used to describe the same report in STAR, NSA and USGRDR

their work. Some of this reporting is done in the form of reports, but in many instances, particularly in basic research, such reporting often takes the form of articles in scholarly journals. All these reports, whether submitted in an 'unpublished' form direct to the AEC, or published in journals, are abstracted in NSA. Published semi-monthly, NSA provides a comprehensive abstracting and indexing service for publications covering all aspects of nuclear science. NSA includes abstracts and indexes not only of USAEC reports but also of all other documents within its subject scope, including reports from other US government agencies, reports from other countries, journal articles, books, conference papers and proceedings, patents, bibliographies, reviews, engineering materials, translations. Entries are very well indexed, and there are quarterly, annual and five-year cumulative indexes which make NSA a very easy tool to use. There is also a single volume, eighteen-year report number index available. The growth of NSA over twenty-three years is shown in Figure 4. During the last few years, there has been a slight tapering off in the proportion of reports to the total entries. It is estimated that approximately 25 per cent of the 1969 abstracts relate to abstracts of reports. About 60 per cent of these reports are of US origin, the remainder emanating from other parts of the world. Thus, the annual world output of open, unclassified atomic energy reports is about 13,000 reports, 7,500 of which originate in the USA, and 5,500 come from other countries.

Partly on its own initiative and partly as a result of the UN agreement on the peaceful uses of atomic energy, the USAEC had been maintaining since the early 1950s a world-wide network of depository libraries. At one time there were fourteen USAEC depositories in the UK, but this number has now been reduced to two, and throughout Europe the reduction of depositories was equally as severe. The NLL, apart from being a USAEC depository fulfilling requests for individual atomic energy reports, also acts as a European clearinghouse supplying complete microfiche duplicate sets of USAEC documents to a number of recipients in the UK and Europe.

The other set of USAEC depository documents in the UK is at the National Reference Library of Science and Invention.

With a few examples I would like to show the *modus operandi* of Nuclear Science Abstracts.

When dealing with STAR, we have already encountered a USAEC report. NSA also uses accession numbers but they differ in function from the accession numbers used by STAR. The STAR accession number is also the identification number of the relevant microfiche, in NSA its role is only that of an accession number. The microfiche produced by USAEC will be identified by the report number. As will be seen in NSA abstract 23–24783 this will now be ORNL 4377. An individual issue of both STAR and NSA will cover a span of accession numbers, but whereas in NSA these accession numbers are consecutive, in STAR they will be scattered, depending on subject grouping within that span.

There is a curious problem with items marked as 'DEP' in NSA, causing some difficulties in interpreting availability of documents. One should visualize that there are three kinds of USAEC depositories. There is a network of one hundred of these depositories within the US. The availability listing as DEP

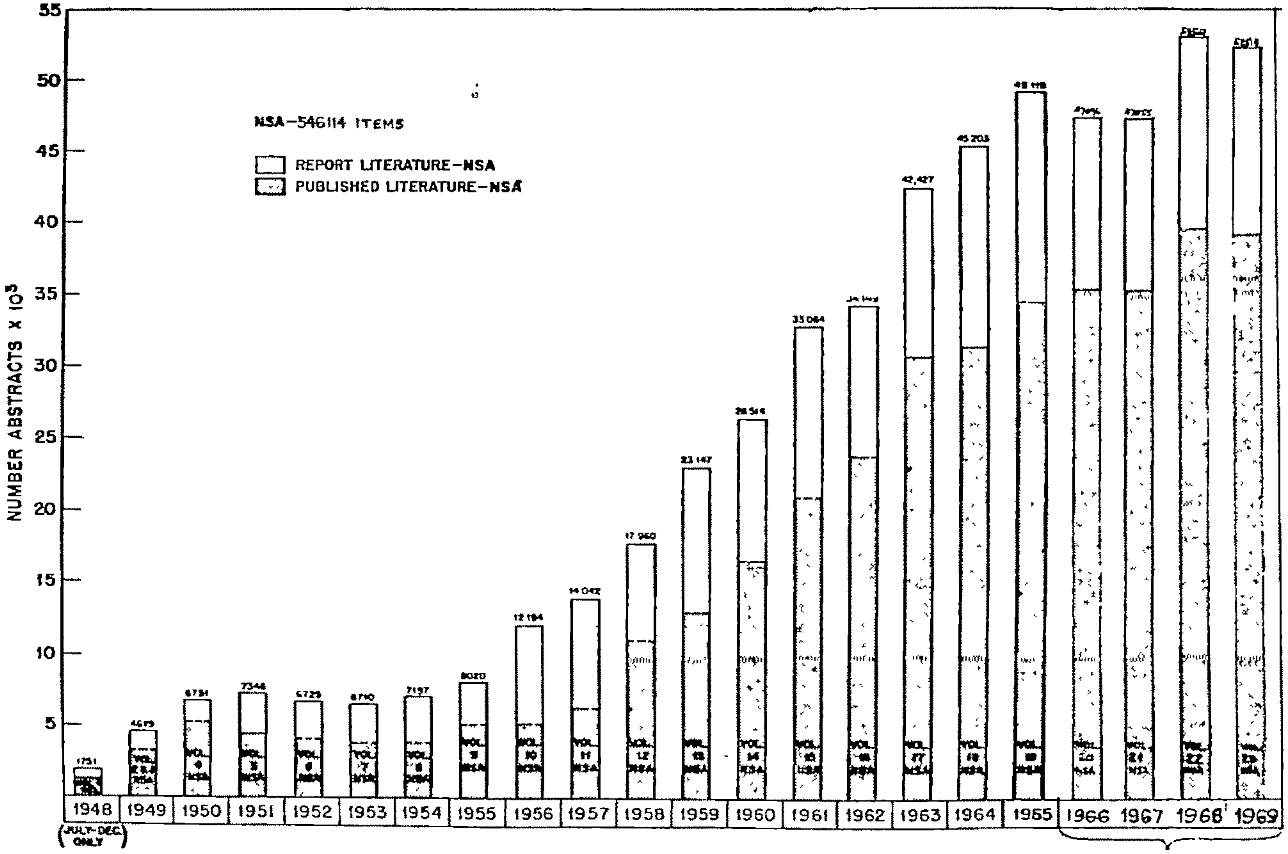


FIG. 4 Nuclear Science Abstracts 1948–1969

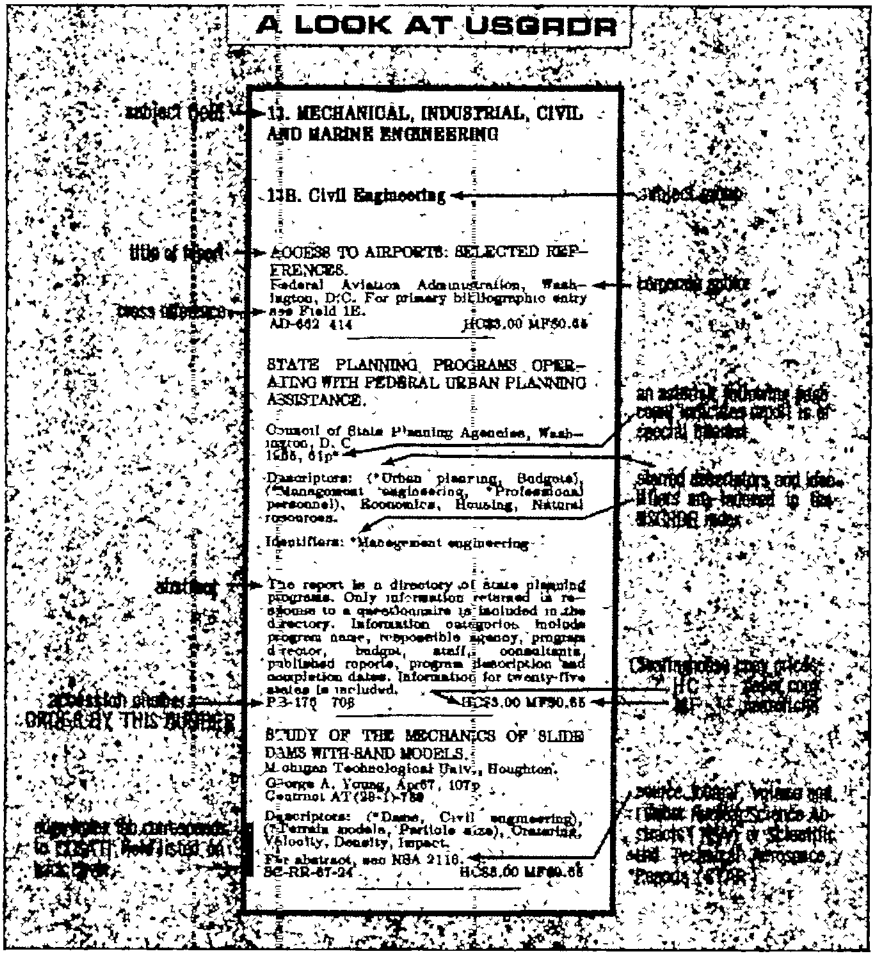
refers to the fact that the document so annotated has been deposited in the US depositories. For copyright and other reasons some reports will not be sent to depositories outside the USA. The documents which are not distributed to this latter group of depositories are to a large extent atomic energy reports originating outside the USA, although there is also an embargo of some US items. Depositories outside the USA fall into two categories: international and national depositories. The former comprise the depositories at the NLL in Boston Spa, at the International Atomic Energy Agency in Vienna, at Euratom in Brussels, and at the United Nations Library in Geneva. There are also USAEC depository libraries in fifty-six countries. The set received at the international depositories is probably marginally more complete than the national sets, but both cover far less than the depository sets in the US. It should not be thought for one moment, however, that the reports not supplied by USAEC on microfiche are lost to the scientists in the UK or elsewhere. For instance, at the NLL all and more of the reports that would find their way into NSA are received direct from the originating source, in most cases well before they are listed in NSA.

I should point out that during the last few weeks NSA has made changes in the listing of reports and there now appears the wording 'US sales only' against the items not available to depositories outside the USA. It should be noted that some items against which 'DEP' is shown may not be available at all. Another point often open to misunderstandings is reports in the USAEC Conf-series. More often than not reports in this series are odd individual papers presented at conferences and not the full proceedings of that conference. CONF 680809 is an illustration of this. There are about thirty individual papers released through many originating sources, but these and many others are available as the full proceedings published by CERN.

During the last two years moves have been made to phase out the international role of NSA some time during the 1970s by replacing it with an International Nuclear Information System (INIS) under the auspices of the International Atomic Energy Agency. As the first step towards INIS, IAEA is publishing Atomindex, which twice a month lists atomic energy reports of all nations. IAEA has an on-demand sale service for microfiche of the reports listed.

The third major bibliographical guide to report literature is USGRDR and its Index. These are produced semi-monthly by CFSTI. Since 1945, CFSTI and its predecessor, the Office of Technical Services, have served as the focal point for the collection, announcement and dissemination of unclassified US government sponsored research and development reports to the scientific, technical and industrial communities. More than fifty US government departments and agencies supply about forty thousand reports each year to the Clearinghouse. There is also a much smaller input from a number of organizations outside the USA, for example from RAE, BISRA, Road Research Laboratory in this country.

USGRDR announces the reports, US government-sponsored translations and some foreign reports and most of these documents are for sale through CFSTI, who also provide an automatic bulk distribution of microfiche to a number of organizations, the NLL, NRLSI and TRC included. However, not all documents listed are available. One group of documents excluded are the earlier mentioned


A LOOK AT USGRDR
subject field
subject group
title of report
corporate author
cross reference
an asterisk following page count indicates report is of special interest
starred descriptors and identifiers are indexed in the USGRDR index
abstract
accession number
ORDER BY THIS NUMBER
Clearinghouse copy prices:
HC = hard copy
MF = microfiche
source journal, volume and
Scientific and Technical Aerospace Reports (STAR)

13. MECHANICAL, INDUSTRIAL, CIVIL AND MARINE ENGINEERING

13B. Civil Engineering

ACCESS TO AIRPORTS: SELECTED REFERENCES.
Federal Aviation Administration, Washington, D.C. For primary bibliographic entry see Field 1E.
AD-662 414 HC$3.00 MF$0.65

STATE PLANNING PROGRAMS OPERATING WITH FEDERAL URBAN PLANNING ASSISTANCE.

Council of State Planning Agencies, Washington, D.C.
1966, 61p*

Descriptors: (*Urban planning, Budgets), (*Management engineering, *Professional personnel), Economics, Housing, Natural resources.

Identifiers: *Management engineering

The report is a directory of state planning programs. Only information returned in response to a questionnaire is included in the directory. Information categories include program name, responsible agency, program director, budget, staff, consultants, published reports, program description and completion dates. Information for twenty-five states is included.
PB-176 708 HC$3.00 MF$0.65

STUDY OF THE MECHANICS OF SLIDE DAMS WITH SAND MODELS.
Michigan Technological Univ., Houghton.
George A. Young, Apr67, 107p
Contract AT(29-1)-789

Descriptors: (*Dams, Civil engineering), (*Terrain models, Particle size), Cratering, Velocity, Density, Impact.
For abstract, see NSA 2116.
SC-RR-67-24 HC$3.00 MF$0.65

FIG. 5

'US Sales Only' USAEC reports, some documents will not be available because of copyright and there are also many other exclusions.

In USGRDR reports are announced in twenty-two subject categories called 'Fields'. Each Field is divided into sub-categories called 'Groups'. The subject arrangement follows the COSATI Subject Category List (AD 612 200). USGRDR coverage includes NASA and USAEC material originating from these organizations and their main contractors; AD reports released by DDC; PB and NBS reports from Department of Commerce, RAND publications, also JPRS and TT translations.

The general arrangement of abstracts is shown in Figure 5. It is important to know the idiosyncrasies of the layout, since this is the key to availability, and form of availability. One of the first things to check is whether the entry is the primary entry or only a cross-reference, and if so to what and where. If there is no price shown after the abstract, this will indicate that the document is not available as a report, or sometimes it may not be available at all. In most cases the entry is really no more than a cross-reference to a journal article, which has been accessioned by DDC or some other agency as a report. Of course when the 'availability' reads: 'Published in unidentified journal—Not available from CFSTI', this is not the most helpful information. If the date of such reports is not very recent, a check in the author index of Engineering Index, etc. may be fruitful.

USGRDR, STAR and NSA, to some extent at least, cover basically common ground. The 'art' is not to give up after consulting only one of them, but also to try the other two. USGRDR Index is helpful towards this end; after all it is a combined index to USGRDR, to STAR and to NSA, but it must be remembered that from the latter two publications only reports originating from within NASA and USAEC and their contractors will find their way into USGRDR Index. At present there still is a certain amount of incompatibility between the computer tapes of USGRDR, STAR and NSA, and this too presents problems.

Other facilities of the Clearinghouse are an SDM (Selective Dissemination of Microfiche) service, and subject oriented current awareness 'flash sheets' such as 'Fast Announcements' and 'CAST' (Clearinghouse Announcements in Science and Technology). One should be aware of a problem peculiar to Fast Announcements: many reports listed are included in this publication from advance information. The result is that long delays may occur before the document is actually available, and in some instances it may not be available at all.

When uninitiated users see report guide titles such as *Nuclear* Science Abstracts, Scientific and Technical *Aerospace* Reports, there is a tendency to shy away from them if these are not the exact fields in which the scientist or engineer is interested. Nuclear and aerospace science in particular is involved in so many other aspects such as basic research, biology, environmental sciences, geology, etc., that the utilization of these very well indexed abstracts can be very reward- g and time saving. If at any time one is interested in papers given by Episcopal edral deans on various aspects of the Creation, STAR will be just the place hich to find it (N68-12081).

this brings me to ERIC. Under the auspices of the US Department of

Health, Education and Welfare, ERIC (Educational Resources Information Center) consists of a network of nineteen clearinghouses engaged in the acquisition, announcement and dissemination of educational research reports. The reports are announced in 'Research in Education', a monthly publication. Some 9,500 ERIC reports have been received at the NLL in 1969 alone. Although the majority of the ED (ERIC document) reports deal with education, many of them are on engineering, electronics, data processing etc. In the engineering field here is a virtually untapped source of information.

To complete the description of reports of US origin I should briefly mention reports of the RAND Corporation. These are abstracted not only in USGRDR, STAR or NSA, but also in 'Selected RAND Abstracts', published quarterly. Most of the RAND documents are available on microfiche. The NLL, a RAND depository library, has a virtually complete set of RAND documents and current RAND reports are available also at the University of Lancaster and Ministry of Defence.

Although strictly speaking not reports, papers of some American professional societies, such as SAE and ASAE, are also published on microfiche.

Many users of report literature regard dissertations as reports. It may be of interest, therefore, that most dissertations in Section B of Dissertation Abstracts International and in STAR with a 70 prefix number should be available shortly in the UK at the NLL as a result of negotiations now in progress.

Now let us move away from the American report scene, turning our attention to what is available elsewhere.

It has been estimated that over 80 per cent of all reports are either of US origin, or are reports from other countries mainly in the atomic energy and aerospace fields. i.e. fields covered on a world-wide basis in STAR and NSA.

Compared with the American output, the number of unclassified, unlimited reports of British origin is very small. Depending on the parameters used to define reports, the number of unclassified, unlimited reports is between 2,500–3,000 per year, with only a small proportion on microfiche. In most cases microfiche versions of British reports are 'imported' into the UK in the disguise of an AD, PB, NASA or USAEC report. Whereas probably about 60–70 per cent of US reports are completely unrestricted, the reverse is the case for British reports. One method to remedy this situation would be the adoption in the UK of an automatic declassification system similar to that which exists in the USA. Whilst under the system generally used at present in the UK, special action has to be taken to remove restrictions from any report individually, in the United States a report automatically loses its security or commercial restriction in time if no special action is taken.

The major producers of reports in the UK are the various establishments of UKAEA, Ministries of Technology and Defence, Research Associations, universities, learned societies and industry. Figure 6 will show the details.

'British Research and Development Reports', published monthly by the NLL, provides details of the British reports received at the NLL. 2,500 such repor were listed in 1969 and it should be noted that BRDR does exclude docum such as annual reports, translations, patents and standards. Various editio the Ministry of Technology's 'R & D Abstracts' will include these latter of British documents, as well as a selection of recent and older US, British and European reports.

Some government establishments, the NLL included, have now facilities for microfiche production and there is also a small number of commercial bureaux engaged in small scale microfiche production.

At present the NLL is also acting as a centre for the microfiching, storage and dissemination of lengthy tables of numerical data, computer printouts, etc. (known as Supplementary Publications) which have been submitted by various journal editors who might otherwise have had to print them at great cost alongside the parent articles, despite the low proportion of their readers who might be interested in such details.

UK reports (announced in 'British Research and Development Reports')

TRC	357
Other Mintech	335
NSTIC	27
Other govt. and semi-govt. (excl. atomic energy)	452
UKAEA	228
Other atomic energy	110
Research Associations	152
Universities	334
Industry & misc.	485
TOTAL:	2,498 *

* The above figures do not include annual reports, pamphlets, Command papers, accession lists, etc.

FIG. 6 NLL Accessions of British reports in 1969

The European, Asian and Australian report output is also comparatively small. Here too the main producers are atomic energy and aeronautical establishments and perhaps one should single out Euratom, CEA and AED as the largest producers of reports, many of which are available on microfiche. Although all three produce abstract guides to their publications, it is probably simpler to locate these documents in NSA. The bibliographical guide issued by the Zentralstelle für Atomenergie (ZAED) is also a very useful reference tool.

The activities and role of IAEA and Atomindex have been mentioned earlier.

Nuclear Science Abstracts of Japan coverage includes a wide range of fringe subjects and is useful to locate Japanese reports, if they are not listed in STAR and NSA.

Some of the conventional abstracting journals, such as Chemical Abstracts, Metallurgical Abstracts, etc. now include a limited number of reports. Unfortunately the references are not always complete and this can create problems. For example, DMIC Reviews of Recent Developments regularly listed there, has a limited distribution and is not available to the general public. This is not mentioned in the abstracts.

This brings us to technical problems associated with microfiche. There are basically only two or three requirements which have to be met in order to give users access to the microfiche report literature. The user needs a legible copy and he needs easy access to a suitable microfiche viewer. He should also have means of retrieval of the required microfiche. Of course, there is also a number of additional desirable features which would be helpful.

It is essential that microfiche are of good optical quality. If the original from which the microfiche is made is of poor quality, i.e. carbon copies, some types of office duplication, poor print and paper contrast, the microfiche quality will suffer. If the camera is out of focus or not parallel with the documents being filmed, the micro-images will be blurred and illegible. Difficulties may arise with small scripts such as subscripts and superscripts of equations which could become illegible in standard reductions. Similar difficulties may arise in filming large foldout pages. Interpretation of photographs appearing in negative form will have its difficulties. Since most microfiche reaching the actual users are duplicates, in most cases diazo duplicates, it is essential that during duplicate production there is perfect contact between the master and the diazo film and also that emulsions face the correct way. A good copy can usually be made from microfiche made by step-and-repeat camera or stripping methods, but some jacketed microfiche may not be reproducible at all.

Other 'optical' problems which affect the user are sideways layouts of microfiche, sometimes with pages facing opposite directions, the relative advantages of negative vs. positive microfiche, etc. Another problem which occurs is the question of missing pages and pages filmed out of order. Referring back and forth between text and tables, figures, references, is yet another 'optical' problem for the user. Fingerprints and scratches on microfiche do not help either.

By far the biggest problem is not the quality of microfiche, for only a small proportion of microfiche has faults, but the availability of and ready access to suitable microfiche viewers. Of course if the microfiche is faulty, no viewer can make a perfect microfiche of it. To incorporate all desirable features into microfiche viewers would probably make them economically unviable. It is therefore necessary to strike a reasonable balance between performance and price. In the following I would like to mention some of the problems that arise.

1. Fixed magnification. If the fiche has non-standard frame area, viewing of the whole frame area is not possible. There is also a need for families of lenses to cope with varying reduction ratios of fiche.
2. Poor definition of lenses, compounded by poor quality fiche.
3. Focussing problems across entire fiche, or when moving from frame to frame; a carrier alignment problem.
4. Screen glare; fixed viewing angles requiring constant head position.
5. Inability to read sideways layouts; contrast insufficient due to lack of light shields.
6. Carrier unsuitable for non-standard size microfiche. This is a major problem with the now obsolete 8 inch by 5 inch microfiche size.

Most of the technical problems of microfiche could be eliminated if v
recommendations and standards (ISO, COSATI, BSI) would be adhered t
some of the problems have been solved already. In the early 1960s USAE
some European organizations started producing 5″ × 3″ microfiche, NAS
an 8″ × 5″ size, DDC and CFSTI adopted 6″ × 4″ microfiche size. Mainly
humanities, for commercial reasons, there are still some odd size mic
produced, but scientific material, reports included, are now produce
universally adopted 148 mm × 105 mm size. The physical storage of mic
of different sizes does present a problem, but one can store 5″ × 3″ mic
(or microcard) interfiled with the 6″ × 4″ microfiche, by slightly adapti
microfiche jackets containing them.

There is a vast store of 'know-how' in the well over half million mic
reports now available. Access to most of these reports can be gained
efficient use of specialized bibliographical guides, such as STAR, NSA, USC
etc. It is hoped that good quality standard size microfiche together wit
cient numbers of easily accessible microfiche viewers will make the t
scientists and engineers easier in making the best use of report literature.

APPENDIX

Glossary of Abbreviations

AD	ASTIA (Armed Services Technical Information Agency) Document
AED	(Zentralstelle fur) Atomenergiedokumentation, Karlsruhe
AIAA	American Institute of Aeronautics and Astronautics
ASAE	American Society of Agricultural Engineers
BISRA	British Iron and Steel Research Association
BSI	British Standards Institution
CAST	'Clearinghouse Announcements in Science and Technology'
CEA	Commissariat à l'Énergie Atomique, France
CFSTI	Clearinghouse for Federal Scientific and Technical Information
COSATI	Committee on Scientific and Technical Information
DDC	Defense Documentation Center
ED	ERIC Document
ERIC	Educational Resources Information Center
IAA	'International Aerospace Abstracts'
IAEA	International Atomic Energy Agency, Vienna
INIS	International Nuclear Information System
ISO	International Organization for Standardization
JPRS	Joint Publications Research Service
Mintech	Ministry of Technology, London
NASA	National Aeronautics and Space Administration
NBS	National Bureau of Standards
NLL	National Lending Library, Boston Spa, Yorkshire
NPL	National Physical Laboratory, Teddington, Middlesex
NRLSI	National Reference Library for Science and Invention, London
NSA	'Nuclear Science Abstracts'
OE	Office of Education, US Dept of Health, Education & Welfare
ORNL	Oak Ridge National Laboratory
PB	Publications Board (document), US Dept of Commerce
RAE	Royal Aircraft Establishment, Farnborough, Hants.
RIE	'Research In Education'

SAE	Society of Automotive Engineers
SDM	Selective Dissemination of Microfiche
STAR	'Scientific and Technical Aerospace Reports'
TRC	Technology Reports Centre, Mintech, St Mary's Cray, Kent
TT	Technical Translation
UKAEA	United Kingdom Atomic Energy Authority
UKSM	United Kingdom Scientific Mission, British Embassy, Washington D.C.
USAEC	United States Atomic Energy Commission
USGRDR	'U.S. Government Research and Development Reports'
ZAED	see AED

NOTE

Since presentation of this paper the USAEC has abolished its depository library system both within and outside the USA. As from January 1970 only the following four governmental and international organizations will continue as official USAEC depository libraries:

National Lending Library, Boston Spa, Yorkshire, England.
Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151, USA.
International Atomic Energy Agency, A-1011 Vienna, Austria.
Library of Congress, Washington DC 20540, USA.

'Dep' in the index entries of Nuclear Science Abstracts will in future indicate that the report so annotated is available from the above institutions.

It should be noted that a number of libraries (mainly in the USA), designated hitherto as depositories, are continuing, through purchase of microfiche, their collections of USAEC reports.

As from 1970, quarterly indexes to STAR and NSA will be discontinued and only semi-annual indexes will be published

FIND

(Facsimile Information Network Development)

JOHN J. HALL

Director, Bristol Building and Design Centre

Paper presented at an Aslib evening meeting, Wednesday, 25th February 1970

Introduction

FIND is the mnemonic for 'Facsimile Information Network Development' which, whilst devised and originally developed by my Centre, owes its present state of development to the support and encouragement of CIRIA and the ABC, who are together promoting a Feasibility Study in 1970. Control and direction remains with the Bristol Building Centre.

FIND aims to provide a day-to-day information service to members of the construction industry, and provide it to meet the requirements of the user. Indeed, all our work during the past four years has been geared, first of all, to discovering the information needs of the user, and then tailoring a service to meet these requirements.

The construction industry

The construction industry is, after agriculture, the largest industry in the United Kingdom. It is unfortunately very fragmented in skills and geographical spread. For example, it includes 20,000 architects and 80,000 builders. It has over 1,000 Local Authority Building Departments and as regards professional and trade skills, these may vary from professionally qualified men to the little builder on the corner with a dilapidated van and a ladder. £4000m was spent on construction last year.

Information is required over very wide-ranging fields, and because of this need and the consequent market within the construction industry, over five hundred bodies exist to provide information to meet the demands of architects, builders and others. The result is that these five hundred bodies have numerous systems and methods of providing the necessary information so that duplication and overlapping is unavoidable.

What is certain is that no one organization or information development will ever meet the total information requirements of this industry. In examining the problem in 1966, it seemed to me that many services had been devised without regard to the actual needs of the users in the field. My first step, therefore, was to research these needs.

Building Centres

Building Centres provide a neutral information service covering building cat[illegible]ducts, materials or services and this service is available to anyone who calls, in w[illegible] or telephones a Building Centre. It is the direct contact on a day-to-day An[illegible]ith the industry in the region it services, which makes the Building

Centre rather unique among information organizations. Unique in that if the information is not provided, the frustrated enquirer has no hesitation in registering his complaint there and then. We decided to take advantage of this personal involvement and attempt to discover user requirements.

We began by analysing 38,000 enquiries. We wanted to discover what sort of questions we were asked; how did users discipline their questions; what was the quality of our replies; how long was the user prepared to wait for an answer; and most important, the percentage failure rate over this very large sample. Because of the large size of the sample we were able to get substantial and valuable evidence.

Question types

Types were broken down and gave the following results:

	Per cent
Building Products, Materials & Services	65
Research & Technical Development	25
Statistics & Legislation	10

Question discipline

This was almost non-existent, for enquirers do not really ask questions. Generally, the enquiries were too widely based or loosely defined. In a large proportion the enquirer included with the enquiry his guess at what the answer would be and thus confusion was worse confounded. It was found that discussing and resolving the problem with an information officer produced the most disciplined form of enquiry, with written mailed enquiries coming closely behind.

When the telephone was used it was not unusual for three sheets of paper to be covered with rough notes by the information officer, and it became clear that use of the telephone gave rise to maximum indiscipline bordering on chaos. In addition, over a large number of telephoned enquiries, it was found that the average time to receive, consider and answer an enquiry was 12 minutes; 2/- at local STD rates and 48/- for trunk calls.

Quality of replies

This depended to a large extent on the knowledge and patience of the information officer and the time available to him. A good information officer, given the time, can tame and discipline any enquiry however undisciplined, and provide a first class reply if he has the information available. Being human and fully involved with industry, it became clear that poorly presented questions were likely to receive poorly considered answers.

Waiting time

Information needs are accorded a very low priority by industry generally. It is quite clear that the better informed an enquirer, the more questions he will ask, whilst the uninformed remain uninformed. This is not because the industry is made up of fools. On the contrary, in this very competitive industry expertise and ability are necessary if companies are to survive. No, the reason is that it is very difficult for managements to assess the cost of getting information. Indeed, top management is generally unaware of how much time and money is spent by lower management in getting answers. In our research, although we became aware that individuals would search for days, weeks and sometimes months to get an answer to their problem, when we asked them how long they would wait for a reply the answer was: 90 per cent—4 hours; 9 per cent—24 hours; 1 per cent—longer.

Regional interpretation

We found that 48 per cent of the answers provided required regional interpretation and regional knowledge.

Failure rate

Over the 38,000 enquiries researched, our failure rate was 8 per cent. This meant that either our reputation was governed by this small failure rate, or alternatively the general irritation or frustration expressed by enquirers meant they had problems which they felt could not be answered by Building Centres.

Effect of distance

The majority of users practised within five miles of the Centre, and outside a range of twenty miles—apart from letters—the Centre was virtually unused.

User requirements

From all this work which occupied the whole of 1966 and most of 1967, we felt we now had a reasonable idea of user requirements which simply stated were:

1. A total information service was required from a single source.
2. The information provided had to be regionally interpreted.
3. A disciplined answer to a question and nothing else.
4. An answer within 4 to 24 hours.
5. The least possible effort on the user's part.

Apart from the necessary education of users and providers of information to discipline questions and answers, the two main factors needed to satisfy user requirements were:

(a) Total information with speedy and effective retrieval.
(b) A fast, effective and cheap transmission system.

The user requirements are formidable for they postulate both a total storage and an effective retrieval system, and much more important, the dissemination to users to meet their requirements. As regards a 'Total Information Store', several committees have sat and have either sunk without trace or muttered 'Computers' as the waters closed over their heads. Although a National Store will inevitably come into being in the future, the FIND network will still be necessary for the dissemination of its stored information. Consider, then, the present dissemination network:

The mail service. If first class delivery became a fact it would still be the case that at least 3 days would elapse before an enquirer got his answer. Our research indicated an actual time of 7–14 days.

Telephone. This leads to the most undisciplined form of enquiry. It is wasteful in time and resources and cannot convey diagrams or sketches.

Telex. This is much better than telephone but suffers the limitation of being unable to transmit diagrams or sketches; is liable to typing errors in transmission of data, which could prove costly; is not particularly mobile, and its cost, coupled with operator who will herself undoubtedly possess varying skills, puts it out of our consideration.

Facsimile. Left with facsimile we have the doleful and dismal report of the Ministry of Health's Technical Memorandum No. 18 and the hardly more encouraging American reports from 1949 to 1968 where university library was linked with university library with miserable conclusions. The *Unesco Bulletin*, vol. XXIII no. 1, published Jan.–Feb. 1969, contained a survey of the American facsimile scene outlined by David Heron of the University of Kansas Libraries.

I felt it would be unrealistic to tackle the whole problem all at once. Success was more likely to be achieved in small steps. These steps have taken me and my staff four years and our present development has been borne of careful research, satisfying the user needs during the development period, whilst at the same time not losing sight of the fact that someone has to pay for the service.

Total information and instant retrieval

It is impossible for any library or any single repository of recorded knowledge to be self-sufficient in satisfying a user's demand for information. This becomes more obvious as the number of users increases, the flow of recorded information more prolific, and the means of communication reduces the barriers of distances, language and rigid specialization.

Accepting this, the establishment of a National Information Tower with its computer, whilst it will come, is unlikely to be with us for the next decade and we cannot look in this direction for salvation.

What we can do is to consider the hundreds of organizations serving the information requirements of industry. Some of them dominate: for example, the Building Research Station, the Ministry of Public Building and Works, whilst in the manufacturing and trade spheres the Brick Development Association and the Timber Research and Development Association leap to mind. These and other bodies have efficient and effective libraries, albeit within specialized fields. More, the likelihood is that they are individually up to date. If, therefore, these bodies could be persuaded to co-operate together and a means found to so interlink them that disciplined answers to disciplined questions could be provided in a maximum of 24 hours, then the result would be a first class, almost total information service that would hold the field until the National Tower came into being.

As regards the co-operation of these information sources of FEEDS, as was to be expected, reactions varied. Fortunately there was more support than otherwise, principally because it was quite clear that this proposal suggested that industry should help itself. It was not suggested that any one organization should command and control, rather would the network of FEEDS gain its strength from the freely given support of each link. Together the interlinking of these main resources or FEEDS would produce an information service of impressive depth and powerful resources.

This is a particularly important point because many fine information services have computer and microfilm services which can be interlinked into the network merely by having an adjacently installed facsimile machine. The network, in answering user enquiries, will bring to the users' attention the existence of these services.

To date, these combined sources have answered 5,000 questions, all within 24 hours, and these are questions that most certainly would take 7–14 days by existing means. The quality of reply marked by the user has been: 'Bad'—nil; 'Fair'—16 per cent; 'Good'—84 per cent.

This resolved half our problem. The still more vital half remained. How to get the answer provided by the networked information FEEDS to the user, bearing in mind the necessary question discipline that would be required; the time scale of 4 to 24 hours; the little effort on the part of the user, and perhaps most important that the service should be made available right down to the smallest builder in the remotest area.

In resolving these requirements, the facsimile machine came into its own and negatived the Ministry of Health and American reports. Both these reports were concerned with specialist communicating with specialist. In our case it was a very large, fragmented, dispersed and non-specialist information user communicating with information specialists, the saving grace being that information filters—that is, Building Centres—acted as filters and translators between the user and the specialist. More, the employment of eleven Building Centres acting as Regional Outlets fulfilled the necessary requirement for regional interpretation of the FEED answers and we knew that this was necessary in 48 per cent of the cases. Facsimile also resolved the following problems:

Question discipline. The moment the enquirer is given a pen and paper and asked to write down his question, in all cases his question is more highly disciplined than if he were allowed to write a letter, telephone or call to discuss it. More, it is particularly easy for the information officer in the Regional Outlet to vet the enquiry with the caller, either by a return facsimile transmission or by personal discussion. Thus it is only the agreed disciplined enquiry that is transmitted to a FEED and this limits their research field to find an answer.

We are particularly conscious of this need for discipline for it cuts the enquiry down to a few lines, minimizes transmission costs and reduces specialist research time to a minimum.

Time scale. Whilst the caller dictates the time scale, the Regional information officer can see at a glance if the time allowed is practicable and will advise the caller accordingly. Because of the flexibility and speed of facsimile, from 3,000 transmitted enquiries, 90 per cent were answered in 4 hours and the remainder within 24 hours. In the early days we kept statistics on failure to meet the time scale, but these became so few and far between that we now regard time failure

as almost non-existent. The FIND Service provides replies in the time scale of 4 hours—'B' rating, and 24 hours—'C' rating.
Little effort on the part of the user. With the present number of information services available to Industry it is the case that the user tries one after the other with no certainty of success and he is accustomed to seeking for an answer for hours, days and weeks. Our work shows that as he recognizes that we can provide fast answers over wide information parameters, he is prepared to make the effort and spend time to send us a considered question, and he recognizes the existence of a single information outlet. If in the rare event we cannot give him an answer, at least he knows that the answer is not discoverable or alternatively it will take a very long time to uncover it.
Available to the man in remote places. From our work we knew that no matter how effective the information outlet, the number of users declined very rapidly outside a twenty mile radius so as to be virtually unused at a thirty mile radius. This is true not only in this country, but also in Europe, where the Boucentrum faces a similar problem. With the facsimile machine we can put the full resources of the network wherever we place the machine in a subscriber's office, be it University, National Contractor or Local Authority, and in addition to serving the subscriber, he can also make it available to service other members of industry in that area.
Saturation of machine. One very real problem to be faced is that the more successful a system, the more likely it is that it will be increasingly used. Work has therefore been carried out on the saturation points of both machine and individual outlets' service. One factor which mitigates this problem is the fact that Building Centres can answer between 86 per cent and 92 per cent of all enquiries from their own resources without recourse to the network.
Getting it to the user. We achieve this by installing a facsimile machine. We can service both the individual subscriber, Local Authority, National Contractor, University or Large Practice by directly interlinking them with the network. In the same way we can leapfrog the twenty mile boundary by putting a machine centrally in an area remote from a Building Centre. For example, from Bristol I serve the industry in Cardiff with a machine in the University of Wales; in Taunton the county architect of Somerset makes his machine available to local industry.

We therefore see FIND as a two tier service. The first tier will be the direct interlinking as I have described. The second tier will be for the smaller builders and architects who are unable to afford the comparatively high cost of a machine. These users can be serviced by calling, writing or telephoning—in that order—their local Building Centre or local facsimile machine outlet.

As regards costs, for our Feasibility Study Year 1970, directly linked subscribers will pay £600 to include the machine rental charge, whilst casual users will pay £1 per question. At the end of the year we will have a good idea of the costs of the network as a whole.

In considering these costs, they have to be related against a background of a saving of 1,200 man hours a year for a large practice; the fact that it costs an employer £7 a week or more before any employee does a stroke of work, and the fact that sickness and holidays leave his information requirements uncovered.

From the work we have done on the machines we are quite certain that as more machines are placed it is clear that the means of communication opened up will be used by companies for more effective control and management of their organizations and that information retrieval will be regarded as a bonus where the machine is concerned. Confirmation of this will mean the removal of the machine charge which is a major factor in the costing of the FIND service and will result in an information charge acceptable to the user and conducive to a viable service.

DISCUSSION

MR J. E. HOLMSTROM (Independent) asked on what the time of transmission depended. MR HALL said that this depended on the vertical length of the transmission. At present it took 6 minutes to transmit an A4 sheet. These were early days however and already a great deal of work was being done to speed up the transmission rate. There was talk of present minutes being reduced to a few seconds.

MR L. L. ARDERN (University of Strathclyde) said that he had been disappointed when the announcement of a meeting on 'facsimile transmission' in the Aslib Calendar from August to November changed in December to 'FIND (Facsimile Information Network Development)'. He agreed with the speaker that there was nothing new in facsimile, and that a greater definition was required for normal library work using these techniques. He then showed the meeting a copy of the page of the *Daily Express* which had been transmitted in 1967 from London through a satellite to the US, and then to Puerto Rico where the page had been ready for printing in 16 minutes after the transmission started. Definition here was more than adequate for the 6 point print. He said that we needed to exert greater pressure on the manufacturers to get them to give us a flat bed scanner for the transmission we would need. MR ARDERN then asked three questions: what was the resolution in lines per inch of the present machine; was the machine similar to the Xerox Magnafax, which was frequently described in the US journals two or three years ago; finally, how many of the Building Centres had had telex before the FIND experiment started. MR HALL replied that the resolution in lines per inch was 96; that the present machine was not the same as the Magnafax; and that two of the Building Centres had had telex before the FIND experiment started.

MR B. D. RODEN (British Standards Institution) asked if there was any compatibility between different facsimile equipment. MR HALL replied that there was no compatibility at the moment even between different machines made by the same company. It was likely that the Post Office would require facsimile equipment to be compatible at some future date. MR RODEN also said that he believed that the development of facsimile transmission equipment was towards ignoring the white spaces, and a large AO architect's plan would pass at the speed of an A4 typed sheet. MR HALL replied that existing cheap facsimile systems had evolved from considerable manufacturing research and development. Already there were indications that manufacturers were improving on existing products and were researching further developments aimed at increasing speed and continuous unattended operation. The existing speed of transmission was necessary to ensure acceptable resolution. Slower transmission speeds would improve reproduction quality and vice versa.

MR A. E. CAWKELL (Institute for Scientific Information, Europe) said that at a recent conference near Washington Mr Hall's remarks about 'Failure' of facsimile in an inter-library environment in the US had been confirmed. This had not been a technological failure (although the inability to use bound volumes was a limitation)—it had been simply that subscribers had not been prepared to pay for that amortization, overhead and running costs, incurred at a particular utilization rate. Evidently the transmission of documents by post had not been fast enough for the average user, and the speed premium had been too high. Mr Cawkell asked whether FIND users, if asked, would be prepared to pay the real cost difference between a postal and a facsimile service. He appreciated that usage between information centres could be large enough to justify costs but he did not understand the speed/cost claims made for the complete enquiry loop. Presumably the small builder, stated by Mr Hall as being the largest class of potential subscribers, could not possibly justify the cost of his own facsimile equipment. Presumably he posts his enquiry to the local centre, gets the benefit of a facsimile-connected information centre service, and receives his reply by post. Confining his question to one of speed, and since Mr Hall had stated that the great majority of users wanted a 24 hour service (he had not said whether they had been asked what they were prepared to pay for such speed), Mr Cawkell questioned whether the inclusion of the postal service into the loop did not in fact make the actual speed very much slower. Mr Cawkell also went on to say that in answer to the questioner who suggested that the Post Office data transmission services had imposed, in some way, a limit upon the resolution of transmitted type faces, the technical record showed that a user can operate any time/band width/noise tradeoff. By halving the speed of transmission, the resolution of any particular transmitted detail was approximately doubled. MR HALL said that the basic difference between US experience and ours was that in the UK distances were much shorter, reducing transmission charges and this feature, coupled with the large number of important information sources or 'feeds' interlinked by this means, provided an information service that was being appreciated by enquirers. As regards using the service, builders who were not able to afford the machine, called, telephoned or wrote to the Centre. The number of enquiries actually mailed was very low and this was possibly because enquirers were either too busy to write a letter or alternatively, and much more likely, could not wait for a mailed reply. If, however, the mail was used, the time delay to the enquirer was halved because FIND could get answers in 24 hours and post them back to the enquirer who would normally be in a local post area. However, speed was not the major advantage of the FIND service. It was the almost 'total' day-to-day information service provided from a single source. As to whether members of the professions and trades would pay for this service, this was one of the conundrums which the FIND Feasibility Study for 1970 was trying to answer. Certainly the day of free information was passing.

MR R. H. DE VERE (NRLSI) informed the meeting that the Nippon Electric Company (PO Box 1, Takanawa, Tokyo) manufactured a telefacsimile machine with the following specifications: (1) Flat-bed scanning. (2) At normal speech lines, the speed was 4 minutes per foolscap page and the resolution 96 lines per inch; for high speed transmission circuit the speed was 56 seconds per page and 120 lines per inch resolution, or 45 seconds per page and 96 lines per inch resolution. (3) The cost was £1,750. The machine was at present undergoing trials with the Post Office. The British Agent is George Anson & Co. Ltd, Business Systems & Equipment, Anson House, 75–79 Southwark Street, London SE1, from whom trade literature is available.

MR G. WHATMORE (International Publishing Corporation) asked if the quality of resolution was good enough for small type faces. MR HALL replied that the manufacturers could not guarantee resolution below 10 pt. However, it had proved in practice that smaller point than 10 pt could be deciphered, but this depended on a clear telephone link.

MR P. HAMILTON (Beecham Research Laboratories) suggested that when a journal reference was sent as an answer, one was not necessarily sending an answer since the user may have no access to a library having this journal. MR HALL replied that wherever possible the gist of the information contained in a journal was transmitted with the reference, in answer to an enquiry. It was for the enquirer to decide whether the information provided made it worth his while to seek or purchase the appropriate journal and it was the practice that the enquirer returned to seek advice as to where he could obtain the journal. The provision of a reference only was certainly not an answer that would meet the approval of a user in the field.

MR F. W. MATTHEWS (ICI) asked if the success of facsimile transmission which Mr Hall reported depended on the fact that sketches and drawings were involved in enough of the questions and answers to justify it. He also asked how the cost compared with telex. MR HALL replied that in large measure, yes. The construction industry was a 'technical' industry and it was the case that professional men and tradesmen began their enquiry with an explanatory sketch. More, accurate detailed data was essential and both these factors require the use of facsimile. As regards comparative costs, telex was well established whilst cheap facsimile was still in an embryonic stage. At present machine costs were comparable but facsimile was cheaper because it required no semi-skilled typist, as was the case with telex.

MR R. S. F. DUFF (Barking Regional College of Technology) asked if Mr Hall could foresee a practical use of facsimile transmission between separate sites of an organization such as a Polytechnic, and, if so, what would the costs be (i.e. a machine which was not connected to FIND, but restricted to the parent organization.) MR HALL replied that their limited experience suggested that facsimile machines would become a management instrument to speed communications between organizations. In Bristol, the Chief Constable had pioneered a facsimile network which appeared to have been very successful in transmitting data between various forces. As regards costs, the present machine used in FIND cost £40 a month and if the manufacturing company decided to market it, costs would vary between £40 and £35 per month, depending on the number of machines in the network.

MR G. MCTAGGART (Industrial Communication Consultants) asked the speaker if the commitment to provide a full answer to an enquiry ever worried him. MR HALL replied that this did worry him but no man or organization, he said, would commit himself to offering a *total* information service. The FIND service had resulted in a doubling of enquiries at his Centre which seemed to indicate that users appreciated the quality and speed of the service. MR MCTAGGART also asked if there was any need for a change in the design of manufacturers' and other technical literature. MR HALL said there was a need for technical information and fixing details to be more prominent in technical literature. It was the case that a great deal of literature used space to reveal the female form or glorious technicoloured futuristic developments, and the necessary technical information was tucked away in the small print. It was often necessary to mutilate the literature in order to extract the necessary information for FIND transmission.

MARY SALE (W. S. Atkins & Partners) asked what the cost of answering each question would be after the annual rental of £600 had been paid. She asked whether in fact this was a rental, or a subscription to the service with the rental of the machine added to this. MR HALL replied that there were no hidden costs involved. Costs had been carefully calculated to exclude them. The annual rental of £600 included both the machine rental and the FIND information service for the Feasibility Study year. As a subscriber would *ask* questions, the cost of providing the answers would be borne by the appropriate Building Centre or CIRIA outlet. The cost of answering any question averaged £1 by conventional means. Whilst the cost of a facsimile machine was included with the information service, then, as expected, the cost of answering a FIND question was much higher at the present time.

MR P. HOEY (J. Lyons) said that Mr Hall had mentioned that during 1970 he would receive 54,000 enquiries and that this continuing increase in the number of enquiries would have to be halted. He asked how Mr Hall intended to curb this increase. MR HALL said that during the experimental work no charge had been made to enquirers. Thus users had not been slow to discover the value of the FIND service and the number of enquiries had risen rapidly, and if projected into 1970 the enquiry rate would reach the figure stated. A charge of £1 per question was now being made to casual users, and in addition directly linked subscribers were being parcelled geographically, so that they were distributed evenly between the twelve Building Centres and CIRIA outlets.

MR B. D. RODEN (BSI) said that the BSI was investigating the possibility of charging for information. Industry and the world at large had been used to getting its information for nothing, but would have to become used to paying an economic charge: (1) in respect of the search time; (2) in respect of the usefulness and time/material saving to the enquirer. Unfortunately (2) did not always show up in the accounts, nor was it easily demonstrable to a board of directors. MR HALL agreed that higher management was not aware of how much time was being wasted at the lower levels. On one occasion at a FIND meeting a senior executive of a National Contractor had spoken of his company's own information resources and had stated that he (they) would not need the resources of FIND. Mr Hall had been able to point out that the executive's company staff in his region had headed the list of enquirers at his Centre. Clearly, the abashed executive had been unaware of this. One directly linked FIND subscriber had reported a saving of 1,200 man hours in 1968 in *librarian time alone*, and this gave an indication of the bill paid by industry overall in seeking information. For a man earning £23 a week in the construction industry, it cost the employer £7 2*s*. 8*d*. a week before he (the employee) began to work. It was this factor which presaged the end of free information services for information, and research services were subject to similar charges which had to be recovered.

AUTOMATIC THESAURUS CONSTRUCTION AND THE RELATION OF A THESAURUS TO INDEXING TERMS

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MY RESEARCH over the last few years has been concerned with the use of automatically-obtained keyword classifications for information retrieval. Such a classification can be described as a thesaurus, but those classifications which have been most successful in my experiments do not resemble the normal kind of manually-constructed thesaurus, and the bases on which automatic and manual thesauri are constructed are quite different. Human beings explicitly consider the meanings of words in grouping them, but word meanings are not accessible to computers. Automatic word classification is therefore based on information about the distributional behaviour of words in documents, on the assumption that words which behave in similar ways in terms of document occurrences are semantically related. That is to say, groups of words which are based on the statistical associations of their members in documents should reflect their meaning relations, at least sufficiently for the purposes of retrieval.

This research grew out of earlier work on the use of an extracted keyword network, which was intended to permit the substitution of one keyword for another to enlarge the scope of request–document matches. It was recognized that much of the fine structure of the network was disregarded in searching, which essentially involved groups of proximate items, and the direct use of a simpler classification seemed desirable. At the same time, constructing a classification automatically would hopefully have economic advantages, and more importantly, would give more objective results where large numbers of keywords were involved. The starting point for our research on classification was therefore an interest in finding groups of keywords which tend to co-occur in documents, or rather document descriptions, since our primary material has consisted of lists of extracted keywords rather than actual document texts; and the object of the enterprise was to provide sets of substitutes for keywords which could act as matching alternatives, in the usual way.

The attempt to construct a classification automatically presents two different types of problem. One is setting up suitable class definitions and providing satisfactory program algorithms for finding classes on a given definition. In the absence of a well-founded general theory of classification there are serious difficulties in this area; however, even assuming such a theory, or at any rate having a number of more or less sound procedures to choose from, the major problem in the retrieval context is deciding what sort of classification is required. We can consider a keyword classification under three heads, namely what sort of linguistic, classificatory, and retrieving properties it should have. For example, should we look for classes which *de facto* consist of synonyms, are confined to very strongly connected items (where connections are defined in terms of co-occurrences), and are selective in retrieval in the sense that they do not retrieve too many documents? We in fact started by looking for classes which linguistically represent topics, permit a loose pattern of connections among members and allow words to appear in more than one class, and are exhaustive rather than selective in retrieval. This was because we thought of a classification primarily as a recall-promoting device which would allow a wide range of substitutes for terms, though the fact that terms could appear in different classes would distinguish substitutes appropriate to one sense or context of a word from those appropriate to others.

The first experiments on this basis, using Needham's theory of clumps, were not very successful, in terms of comparisons between their retrieval performance as represented by recall-precision graphs and the base performance for the unclassified keyword vocabulary; and since it seemed that the assumptions about the kind of classification which was required might be unfounded, we proceeded to a much more comprehensive set of experiments designed to test alternative assumptions under the three headings. These experiments were carried out with the Cranfield collection of 200 documents and 42 requests in aerodynamics, with the initial indexing not by keywords but by *terms* representing groups of morphologically related keywords. The indexing vocabulary consisted of 712 items with a wide range of frequency of occurrence, and the document and request descriptions of an average of 32 and 7 items respectively. There were 4–5 relevant documents per request. The tests covered a large range of variables and involved systematic controlled comparisons between different values of these variables. For example, several different definitions of the connection or similarity of a pair of terms were examined, and a dozen different formal definitions of a class as a set of terms brought together by such and such a pattern of connection relations. The overall conclusion to be drawn from the experiments was nevertheless a clearcut, and also highly encouraging one: namely that classifications with certain properties give a better retrieval performance than the unclassified terms alone.

That is to say, provided that we restrict the grouping propensities of terms which occur very frequently over the collection as a whole, and that we confine our classes to very strongly connected items, a good performance, at least for the test collection, is obtained. Very frequent terms cannot be thrown away altogether as they make up much of a request and document description. But if they are allowed to appear in classes and hence act as substitutes for other terms, they simply lead to the retrieval in most cases of a large number of unwanted documents. The solution seems to be to regard them formally as unit classes, so that they match only if they are explicitly mentioned in a request. As far as the other formal properties of a good classification go, it seems that it does not matter which definition of a class is selected from a number of alternatives, provided that it leads to classes confined to very strongly connected items: this is simply because with this restriction, different definitions tend to pick out the same groupings. Thus, referring to the headings characterizing retrieval classifications, it appears that under the classificatory heading we want tight rather than loose classes, though we should still allow class overlap, and that under the retrieval heading we want selective rather than exhaustive classes, since groups confined to strongly connected, i.e. heavily co-occuring, terms will not retrieve many more documents than their individual members do. Two of our initial assumptions about the desirable characteristics of retrieval classifications therefore turned out to be wrong. The successful classifications do, however, clearly exhibit topic groupings among terms, like 'ablating capacity combustion shield teflon', for example.

More recent research has been concerned with a detailed investigation of the precise way in which the successful classifications work in retrieval, with a view to obtaining a precise specification of the optimal classifications for document and request collections with particular properties. In general, it seems to be the case that classifications enlarge a request or document specification, that is, make it more exhaustive, so that in retrieval documents can match requests on more items; and since it is generally true that the stronger the match between a request and a document, the more chance the document has of being relevant to the request, if the terms concerned are all strongly connected with one another, the likelihood is that we will get better matches and hence retrieve relevant documents. We are, as it were, promoting relevant documents to higher matching levels than those represented by their simple initial term matching levels, and promoting them more than non-relevant documents. Recent experiments have, moreover, simply served to emphasize the conclusion to be drawn from the first series, namely that the distributional properties of the indexing vocabulary are of paramount importance. In a sense this is obvious, since automatic classification rests on information about the distribution of keywords in documents; but the important point is that the statistical properties of the vocabulary as a whole must be taken into account, so that they can be exploited to advantage. For instance, frequently occurring terms are necessarily less specific (which means that specificity is not simply related to what we would ordinarily call the degree of generality of a word's meaning), and this has to be considered when we think about the construction and use of a keyword classification in retrieval. In a way, the value of a classification of the kind we have been considering lies in the fact that it allows greater exhaustivity while the specificity of individual indexing words, and also word combinations, is maintained.

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SUMMARY OF RESEARCH UNDERTAKEN BY ASLIB, 1966–9

IN 1966, the Government's Office for Scientific and Technical Information offered to increase its support for Aslib specifically to encourage it to build up a viable research department, to undertake systematic programmes of research into scientific and technical information systems, and to provide consultancy services in this field. In response to an appeal from Lord Kings Norton, then President of Aslib, some twenty member organizations agreed to share with OSTI the cost of this new development during its first three years. The three-year development period ended in December 1969, and Aslib considers this the appropriate time to express publicly its appreciation of those who made this venture possible and, also, to give an account of the progress made during this period.

Sponsoring Organizations

Office for Scientific & Technical Information
Beecham Group
Bristol Siddeley Engines
British Aircraft Corporation
British American Tobacco
Cadbury Brothers
Central Electricity Generating Board
Courtaulds
Esso Petroleum Company
Fisons
Gas Council
General Electric Company
Imperial Chemical Industries
John Laing
Marks & Spencer
Metal Box
Pilkington Brothers
Rubery Owen
Tube Investments
Unilever
United Steel Companies

Even as recently as 1966, research into scientific and technical information systems was still a largely unexplored field. The two main problems—in addition to the obvious one of establishing priorities—were, therefore, to recruit and train promising staff, since there was no reservoir of people with ready-made research experience in the subject, and to develop and test research methods. Inevitably, this took time. Nevertheless, the Council believes that the progress reflected in the following summary is highly satisfactory for such a relatively short period of time and, indeed, the Government has offered greatly increased grants for the further development of this work during the grant period 1969–71, provided members of Aslib also increase their support substantially.

The summary is grouped under four main heads. The project serial numbers are repeated in the list of references to published work, and to reports submitted or in preparation, which follows the summary.

SUMMARY OF RESEARCH

A. Users' needs for information

Project	*Aim*
1. Study of use made of technical libraries.	To provide basic data as a guide to individual organizations in planning their library and information services. Enables company and other libraries to be planned rationally and economically on the basis of ascertained needs and usage patterns.
2. Study of flow and use of metals information in Britain.	To provide data for rational development of information services on metals, with a view to ensuring efficient and economical services geared to the requirements of users.
3. Study of user reaction to current-awareness publications.	To provide publishers with planning information, so that these publications can be designed to meet the requirements of specialist users and libraries.
4. Study of use of data by physicists and chemists.	To provide information on which data compilations and data banks can be planned so as to meet the requirements of user libraries and individual users.
5. Geographical study of science/technology libraries and potential users.	To aid the planning of an efficient national system of science/technology libraries.

B. Library systems and procedures

6. Bibliographical records in libraries—an integrated analysis of library procedures using forms.	To develop a model as a guide to the design of optimum system(s).
7. Clerical processes in libraries—undertaken in university libraries but applicable in other types.	To test techniques of systems analysis which can be applied in turn to establish efficient clerical processes.
8. Techniques of constructing a thesaurus for retrieval purposes.	To prepare an authoritative guide for libraries and others to the construction of specialized thesauri for keyword indexing and retrieval systems.
9. Specialized information centres.	To prepare a guide, on the basis of case studies (in mass spectrometry, rock mechanics, intestinal absorption, bio-deterioration and bio-medical engineering), to the development and operation of such centres, so as to obtain efficient information services in the difficult, often multi-disciplinary, fields covered.
10. Comparison of current awareness services in a specialized organization.	To assess the relative advantages of manual and computer services, and of keyword and title searches.
11. Classification and coding of data: an analysis of practice in the construction industry.	To assess the current development of product and process coding as a contribution to efficient technical data retrieval.
12. Classification in science information.	To assess its role in a possible world network of scientific information services. (Undertaken for the International Council of Scientific Unions, at its expense.)

C. Mechanization of library and information processes

Project	*Aim*
13. Computer-based loan records for special libraries.	To economize on clerical costs.
14. Use of punched tape and punched cards in special libraries.	To develop economical multi-purpose systems.
15. Computer-printed location records for regional library bureaux.	To simplify and reduce costs of inter-library loans.
16. Computer-typesetting of bibliographical material—using Aslib *Index to Theses* as example.	To cost against the conventional printing of bibliographical material.
17. Basic systems analysis and design of computer-typeset abstracting journals in physics, electrical engineering and associated subjects.	To provide the Institution of Electrical Engineers with the design study on which its computer-set abstracting journals are now based.
18. Feasibility study for integrated information services in agriculture and related subjects.	To explore the provision of multiple services from a single keyboard input, based on the abstracting/indexing operations of the Commonwealth Agricultural Bureaux.

D. Documentary sources of information

19. Documentation of documentation; studies leading to the publication of *Library and Information Science Abstracts*.	To provide librarians and information officers with an efficient current-awareness service in their own subject.
20. Evaluation of British scientific journals.	To provide data enabling libraries to base their journal subscriptions on rational selection and, in the long run, to guide rational publication of scientific journals.
21. Tests on abstracting journals.	To assess their coverage and indexing efficiency.
22. Use of social science literature as indicated by citations.	To provide knowledge of the pattern of literature use in the social sciences, to guide national provision of library resources in this field.

PUBLICATION AND AVAILABILITY OF RESULTS OF RESEARCH SUMMARIZED ABOVE

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4. Research in progress.
5. Report in preparation.
6. Thomas, Pauline and East, Harry. *The use of bibliographic records in libraries.* Aslib Occasional Publication No. 3, 1969. A second report is in the press, and a third in preparation.
7. Analysis of library processes. *Journal of Documentation,* vol. 26, March 1970, p. 30–45. A further report is in preparation.
8. Report in preparation.
9. Robertson, S. E. and Reynolds, Rose. *Five specialised information centres.* OSTI Report 5050, 1969. Available from the Office for Scientific and Technical Information. A further report is in the press.
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Letter to the Editor

Dear Sir,

I have read with interest Mr Smailes' paper ('The future of scientific and technological publications') in the February issue of *Aslib Proceedings*.

While it is undisputed that the amount of scientific information must of necessity grow with the increasing number of scientists doing research in an increasing number of disciplines, one point appears to have been neglected or at least has not been allowed enough prominence (it was lightly touched upon in the discussion remarks made by Dr Campbell).

The point, that I feel deserves more attention, is the ***responsibility of the author for the quality of his contribution to the flood.***

As to Mr Smailes' definition of quality in answer to Mr Eve's question, I would like to add to 'accuracy, relevance and accessibility' a fourth essential: '***uniqueness***', for reasons that a 'rehashed' item might well possess the first three properties, yet be in all likelihood redundant and therefore of no quality.

In this context I would like to offer the following remarks which I distributed to some EIRMA members after a meeting held on 12th December 1969. The subject under discussion was: 'About the questionable validity of the expression: PUBLISH OR PERISH!'

'1.0 *I believe, we all agree that:*
1.1 Research in all fields and at all levels needs to be based on all available information.
1.2 Information is being produced at an ever increasing rate.
1.3 Rate increase is in part due to the fact that only 10 per cent of all published information is actually new while 90 per cent must therefore be redundant.
1.4 Redundant information can, apparently, be the basis of lucrative business, as can be witnessed by the birthrate of new publications.
1.5 Publication upon publication is being analyzed, transformed and predigested by untold numbers of documentalists, spending untold sums of money on not only duplicate, but multiplicate effort.
1.6 The efforts of abundant information services yield often overlapping, mostly inconsistent and seldom cheap information which cannot be easily incorporated into the user's information system.
1.7 Information systems are often either hopelessly outmoded or not economical for the average user.
1.8 Users have, until now, hardly ever received or asked for the information (systems) they really need.

2.0 *Needed now, therefore, is:*
2.1 The willingness of all concerned users to ask for consistent, uniformly formatted, useful, cheap and un-redundant information.
2.2 Voluntary restriction by authors as well as by publishers to reduce the amount of published material to the actually essential new information.

2.3 A compulsory abstract format to be used by authors of scientific information, non-adherence to which should be cause for rejection by the publisher.

2.4 A reversal of current practice for remuneration that would burden the author with paying a fee for the privilege of having his brain child published.

2.5 Some compulsory way for a publisher to provide, possibly as an option, machine readable abstract information of a specified format, non-adherence to which should be cause for rejection by the users.

3.0 *Even more desirable, and technically feasible, would be:*

3.1 The collection, after abstraction by the author, of all scientific information to be published, in the form of microfilm or microfiche in an international center (and perhaps distribution to national centers), storage of retrieval information at the center(s), ability of users to search by teleprocessing and transmission of desired search output by facsimile methods.

3.2 In this way, there would be no need for typesetting and binding of the information. At least part of the cost of the central agency would be covered through the author's fee. Redundancy checking (similar to screening at a patent office) would be facilitated through the use of a standardized format and the possibility of an immediate in-house search. Users would pay only for the information they actually obtain, in all likelihood less than they would be paying for a conventional service.

If you feel, as I do, that these ideas have some bearing on our mutual problems, you may also feel, that our working group within EIRMA could prove to be very effective and stimulating in channelling the information deluge.'

Yours sincerely,
C. SEGEBARTH
Technische Dokumentation
im Flick Konzern

c/o Dynamit Nobel AG,
521, Troisdorf,
Germany
13th March 1970

CURRENT AWARENESS LIST

Recent additions to the Aslib library catalogue are broken down into twelve broad groups, whose coverage is indicated below. These groups are not mutually exclusive but it is hoped that users will find them helpful in scanning for new items of interest.

Note: These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory.

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres; management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

ELIZABETH MACK
Head of Library and
Information Services

CURRENT AWARENESS LIST

Items are available in the Aslib Library and may be borrowed unless marked to indicate reference copies.*

User Studies

OSEASOHN, ROBERT

Borrower use of a modern medical library by practising physicians.
Bulletin of the Medical Library Association, vol.58, no.1, January 1970, p.58–9.
Survey conducted at the medical school library of the University of New Mexico.

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GREAT BRITAIN. Department of Education and Science

An attempt to quantify the economic benefits of scientific research, by I. C. R. Byatt and A. V. Cohen. London: HMSO, 1969.
25p. (Science Policy Studies, 4)

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Performance of Ruecking's word compression method when applied to machine retrieval from a library catalog.
Journal of Library Automation, vol.2, no.4, December 1969, p.266–71.

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Microdoc, vol.8, no.4, 1969, p.78–81.
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Sectional list of British standards. Documentation (including UDC): standards for the editor, publisher, librarian and information scientists.
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B. C. Vickery MA, FLA, Head of Research, Aslib.

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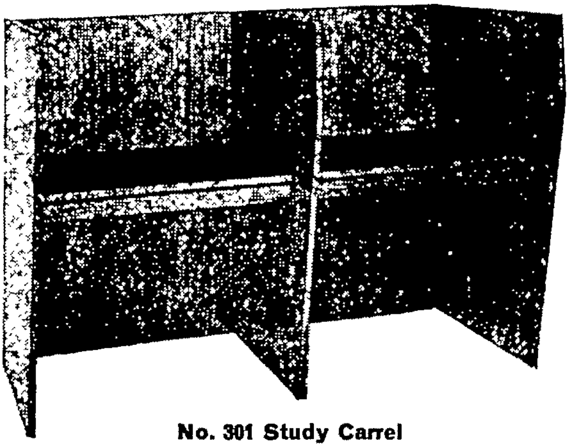

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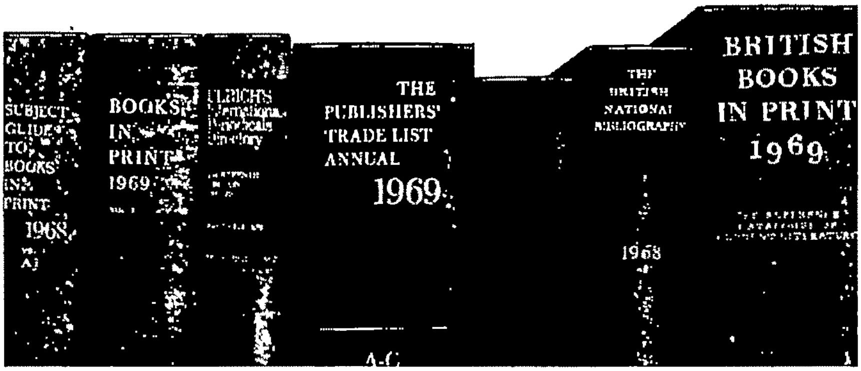
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ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 22 **June 1970** **Number 6**

ASLIB CALENDAR 1970

June	
TUE.30.	Aslib Co-Ordinate Indexing Group. One-day symposium. Engineering and Building Centre, Birmingham. 10 a.m.
July	
WED.1.	Aslib Economics Group Visit: City Business Library, London EC2. 5.45 for 6 p.m.
September	
TUE.8.	Aslib Chemical Group/Technical Translation Group Joint Evening Meeting. 'Technical translations: meeting the need', by Paul H. Scott (BP Research). Aslib. 5 for 5.30 p.m.
MON.21–WED.23.	Aslib 44th Annual Conference, University of Aberdeen.
October	
THU.1.	Aslib Economics Group Evening Meeting and Lecture. Aslib. 5 for 5.30 p.m.
TUE.20.	Aslib Computer Applications Group Circulation Working Party. One-day symposium: 'Computer-aided systems'. Aslib.
WED.21.	Aslib/Institute of Information Scientists Joint Evening Meeting. 'OR man looks at IR', by W. T. Bane (IPC New Enterprises). Aslib. 5 for 5.30 p.m.
November	
THU.19.	Aslib Chemical Group. One-day conference. Quaglino's, London.

Aslib 44th Annual Conference

The overall theme of Aslib's 44th Annual Conference, to be held at Aberdee University from 20th to 23rd September this year, will be 'Research an developments in library and information science: aims, accomplishments an expectations'. Speakers in the seven sessions will include: Philip Whiteman Queen's University, Belfast, and C. W. Cleverdon, Cranfield Institute o Technology; R. A. Fairthorne; M. B. Line, Bath University of Technology B. C. Vickery and H. East, Aslib Research Department; J. Farradane, Cit University; Dr H. Coblans; Dr D. N. Wood, National Lending Library fo Science and Technology, with J. E. Terry, AERE, Harwell. From Cleveland Ohio, comes Professor William Goffman, Director of the Centre for Documentation and Communication Research in the School of Library Science, Cas Western Reserve University, who will complete the picture with a talk abou the research situation in the United States. To conclude, J. R. Sharp of IC Fibres Limited has accepted the challenging task of trying to suggest 'Wher do we go from here?'

To supplement the programme, delegates will be able to go on a visit to on of a number of places of professional or other interest in the neighbourhood o Aberdeen: the Rowett Research Institute with the Commonwealth Bureau o Animal Nutrition at Bucksburn; the Torry Research Station and Marin Laboratory and Library; the Macaulay Institute for Soil Research; King' College Library and Chapel and the new Science Library at Aberdeen University; the Library and Library School at Robert Gordon's Institute of Technology; the paper mill at Wiggins Teape Limited's Stoneywood Works; Crathe Castle and gardens, and the Bridge of Feugh and Banchory; and Grant' Glenfiddich Distillery at Dufftown.

Dainton Committee recommendations

The Director of Aslib was among representatives of the Parliamentary an Scientific Committee who recently met the Minister of Technology, Mr Anthon Wedgwood Benn, Ministers of State for Education and Science, Miss Jenni Lee and Mr Gerald Fowler, and the Lord Privy Seal, Lord Shackleton, t discuss the steps necessary for the implementation of the main recommendation of the Dainton Committee on National Libraries.

The meeting followed statements made in Parliament by the Secretary o State for Education and Science and the Lord Privy Seal announcing th Government's decision to accept in principle the Dainton Committee's mai recommendations, and to investigate the possibility of housing both the Britis Museum Library and the National Reference Library of Science and Inventio on the Bloomsbury site.

Course on teaching methods

Aslib has for some time been aware that there is a shortage of librarians an information officers who have any formal training in teaching methods. Man librarians and information officers who have experience of new or highl specialized aspects of information work and would be glad to pass on thei knowledge to others, are inhibited from lecturing because of their lack o confidence in their teaching ability. To provide a remedy for this situation Aslib has arranged for a course in teaching methods for librarians and information officers to be held at Garnett College, Roehampton, from 15th to 18th September 1970. The course is primarily intended for those who intend to teach librarianship, whether on courses or on staff training schemes, but may also be useful to tutor-librarians in colleges. It will concentrate on the principles and methods of teaching, the planning of instruction and the assessment of students' work. It will be taught by members of the staff of Garnett College.

A notice about the course was circulated to all members in December 1969 and the response was overwhelming. Replies were received from over twice as many people as can be accepted on the course. Details and application forms are being sent in rotation to all those who answered this circular before the closing date, until all the places are taken. If the course is a success, it is hoped to organize similar courses in future years, when it may be possible to offer places to those who have been disappointed in 1970.

BP and the impact of Aslib Services

The Director of Aslib and the Assistant Director (Research), Mr B. C. Vickery, were the guests of the British Petroleum Group in April when a two-day residential conference of group information staff was held at Cambridge. Mr Vickery gave a paper presenting some ideas about the ways in which information work is likely to develop in the future. Such opportunities for discussion with the assembled representatives of an entire industrial group are invaluable for Aslib as a means of obtaining feed-back on the impact of its services on member companies.

Aslib and the Publishers Association

The Director, Assistant Director (Services) and the Publications Officer of Aslib recently met at lunch representatives of the Scientific and Technical Group of the Publishers Association to discuss matters of mutual interest to technical publishers and special librarians. Meetings of this kind are arranged from time to time and have proved extremely useful as occasions for keeping members' interests in front of one of their main suppliers of materials.

Aslib study of the House of Commons Library

The Library of the House of Commons has developed greatly in recent years. Its Parliamentary Division guides the growth of its wide-ranging stock, and answers many quick reference questions from Members of Parliament and other people. The Research Division handles more substantial queries.

To aid its work, the Library has built up a varied set of indexes to Parliamentary and current affairs, and produces for MPs a series of bulletins on current topics. At the end of 1968, in co-operation with the Culham Laboratory of the UK Atomic Energy Authority, an experimental computer-produced literature bulletin was distributed both to MPs and to a selected group of other recipients. The experiment has been reported in the *Journal of Documentation* (March 1970). The bulletins were generally welcomed.

The Librarian of the House of Commons, Mr D. C. L. Holland, subsequently prepared a proposal for a feasibility study of the application of computer techniques to the Library's information processes. It was agreed that the study should be funded jointly by the House and by OSTI. Aslib Research Department has been appointed to carry out the details of the study, working in co-operation with Library staff. Dr H. Coblans, formerly of Aslib, has been appointed as a consultant to the project, and the Aslib staff primarily concerned are B. C. Vickery and H. East.

The broad aim of the study is to determine how far it might be possible to derive a number of different bibliographic outputs from one input of indexed material, and whether such a procedure would be both helpful and economic.

The project is also reporting to an advisory committee, representing Government departments, academics and others, since a second aim is to discover whether such House of Commons index material might fit into any wider bibliographic system concerned with current social matters.

Aslib and UKAEA SDI project

The US Atomic Energy Commission is currently preparing magnetic tapes that carry bibliographic information relating to entries in *Nuclear Science Abstracts*. The tapes contain citations and also keywords derived from the Euratom thesaurus.

During 1969 these tapes began to be received by the UK Atomic Energy Research Establishment at Harwell, and are being used to provide an experimental SDI service to selected scientists at Harwell and elsewhere, based upon the computer matching of keyword profiles against the tape keywords.

This service is running parallel to a long-established 'manual' dissemination system, in which currently received journals and reports are scanned, and potentially interested customers are notified. With partial financial support from OSTI, Mr J. Terry of the AERE Information Branch is assessing the performance of the two methods of dissemination, and Aslib Research Department has been commissioned to take part in this evaluation.

Programs are available to search the *NSA* tapes on words appearing in the titles of the citations, and SDI notifications based on 'natural language' profiles are also being issued. A second part of the evaluation is to compare these with the keyword matching. Dr S. Datta is participating in this project on behalf of Aslib.

Aslib Consultancy Service

An indication of the range of organizations that have made use of the Aslib Consultancy Service in recent years has been given in the Annual Report for 1969 which appeared last month. Government, public, and international organizations figure largely in the list of clients, and although the greater number of assignments comes from private industry, the greater part of the Service's current commitments in terms of manpower are for Government departments. One current project for the Ministry of Public Building and Works was described in detail in the April 1970 issue of the *Proceedings*.

Another long-term Government contract is with the Foreign and Commonwealth Office, where an Aslib consultant has been working with the Civil

Service Department to advise on improved retrieval systems for the information contained in their departmental registries. One requirement here has been to provide a central printed index to the large numbers of file titles held. The technique chosen was to produce an articulated subject index using the computer programs developed by Dr M. F. Lynch at Sheffield University and recently rewritten for the ICL 1900-series computers. The special nature of these file titles and the subject field involved has made it necessary to introduce certain modifications into the original programs and a recent trial run has shown these to be effective.

Commercial users of the Consultancy Service include a large food manufacturing firm whose information services have already been developed to an advanced level and which in many ways might be regarded as a textbook example of how such a department should be run. Like many such units, however, they are faced with increasing demands on their services and the need to process more and more information, with no immediate possibility of extending their resources in terms of budget or staff. They have therefore commissioned Aslib to review their organization, to comment on its efficiency and effectiveness, and to assist them in improving its productivity where possible. The first and most difficult step in this project was to induce the client to define in detail the objectives of the information service. This entailed writing down a definition of the subject field to be covered and the categories of staff for whom the facilities were intended. Once this was achieved, it was possible to put a yardstick against each of the services provided and to assess whether the right amount of effort was being deployed on them. The assessment in many cases has to be made by the client, the consultant's main contribution being to help him obtain the best available data on which to base a decision.

Aslib journals

The Publications Department recently exhibited Aslib's full range of journals, *Journal of Documentation*, *Aslib Proceedings*, *Aslib Book List*, and *Program: News of Computers in Libraries*, at the International Periodical Exhibition held in Brussels from 14th to 22nd March. The Periodical Exhibition was part of the 2nd Brussels International Book Fair organized by the A. P. Wales Organization of London. Much interest was shown in the Aslib journals at the exhibition and as a result several new subscriptions were ordered.

The Department is also displaying a selection of Aslib's publications, by arrangement with the Book Exhibition Department of the British Council, at the Bogota Trade Fair, Colombia, to be held from 10th to 26th July 1970.

Study of specialized information centres

Part 1 of the report on the study of specialized information centres, which Aslib's Research Department carried out during 1969 under contract from OSTI, will be available shortly as Aslib Occasional Publication No. 5, *Notes on the operation of specialized information centres*, by John Martyn. This is the main part of the report and describes the establishment, administration and operation of specialized information centres. Its findings should help potential sponsors to judge the feasibility of establishing further information centres of this kind.

It costs 15*s* net and orders should be sent to Publications (Sales), Aslib, 3 Belgrave Square, London SW1.

As announced in the March issue of the *Proceedings*, part 2 of the report, entitled *Five specialized information centres*, by S. E. Robertson and R. Reynolds, (OSTI Report No. 5050), is available from OSTI or on loan from the NLL.

Mrs L. Vilentchuk

Among recent visitors to Aslib was Mrs L. Vilentchuk of the Centre of Scientific and Technological Information, Tel-Aviv. Mrs Vilentchuk was a personal member of Aslib and spent a year in England some ten years ago when she was well known to many members of Aslib.

The purpose of her visit was to arrange for two or three information scientists to be invited to Israel on Aslib's recommendation in order to give a series of special lectures as part of a one-year's postgraduate course in information science, to be held in Tel-Aviv during 1970–71.

Chemical Group

Over the last three years the Chemical Group has taken on a new image and has acquired a reputation for being one of the most progressive groups within the Aslib organization. This has been achieved by the adoption in principle of sound business methods, of which aggressive forward planning must be regarded as one of the most important. The adoption of the new Constitution has made such long-term planning feasible, and the subsequent work programme a much easier task. Furthermore, the appointment of Special Officers from Committee ensures that each project is progressively and actively pursued to conclusion.

A unique feature of Committee activities over the last eighteen months has been the constant search to identify areas which are not adequately covered by existing information practices, and to this end several feasibility studies have been carried out. Current investigations are concerned with certain aspects of translation coverage in the chemical field and with the potential of management techniques applicable to library and information work.

Education is always prominent in Chemical Group activities and arrangements for regular courses in Basic Chemistry for Non-Chemists, at the Borough Polytechnic, and Polymer Chemistry at the Loughborough Institute of Polymer Technology are established. A course dealing with Computer Appreciation was held during 1969 and can, if required, be repeated. The successful organization of several courses being run in parallel during the same year has been achieved by the appointment of an Education Officer with sole responsibility for these functions.

The Conference on Techno-Commercial Information held at Loughborough University during March 1969 climaxed the end of a concentrated study of this area of information activity which had involved during the previous months close co-operation with the Industrial Market Research Association. Although interests in this area are still actively pursued, serious attention is now being given to management techniques and to the effect of future developments in the chemical industry on information requirements.

The recent Annual Lecture and two future conferences illustrate clearly the Committee's activity in these peripheral but related subjects. The Annual Lecture provided a summary of prognostications arrived at by application of the Delphi method of technological forecasting to the UK chemical industry. The 1971 conference 'INFOCHEM '70's', to be held at the University of Surrey at Guildford from 31st March to 2nd April, will continue this theme by presenting three papers on forecasting in the product areas of polymers, agriculture and pharmaceuticals. This session will be followed by papers in which the speakers will attempt to identify those areas in which rapid developments in information activities can be expected. The emphasis will be on mechanization but, additionally, the Committee hope to present speakers who will deal with the methodology of management techniques applied to information and library science.

A one-day conference is planned for November 1970. The papers planned for this meeting are intended to present a comprehensive picture of the chemical industry ranging from background economics through new plant planning to the contractors' role. It is hoped that this meeting will give members a broader appreciation of the industry.

A joint (evening) meeting with the Translation Group is planned for 8th September 1970.

The continued success and indeed future development of the Chemical Group depends, to a great extent, upon the enthusiasm and support of its membership. Suggestions regarding possible meetings and papers will be welcomed by the Committee.

Audio Visual Group Workshop

A Workshop/Conference of the Audio Visual Group was held on Thursday and Friday, 7th and 8th May 1970, to provide a forum for discussion between librarians working with audio visual media and those who are now facing the problems which this type of librarianship poses.

The Workshop was fully subscribed, and a full complement of fifty-five people attended on both days. Delegates represented a wide variety of organizations including Colleges, Universities, Public Libraries, Commercial Firms, Government sponsored bodies and Television services. Many were not librarians, but all were concerned with the storage, documentation or exploitation of audio visual media.

Speakers were: Mrs Pamela Lea, Schools Services Librarian, Didsbury College of Education, Manchester; Miss Daphne Moss, Librarian, Radio Times, Hulton Picture Library; Miss Marie Slocombe, Librarian, BBC Sound Archives; Mrs Diana Wyllie, Managing Director, Diana Wyllie Ltd, Film Strips and Slides; Mr L. J. Lawler, Director of Television Services, University of Manchester and UMIST.

The speakers gave an outline of their work, the problems they had encountered, their solutions, and opinions on future development in their particular field. Questions were encouraged and discussion was lively.

A visit was made to the National Audio Visual Centre, 254/256 Belsize Road, NW6, where the Group received a talk from Mr A. Crocker, Deputy

Head of the Experimental Development Unit, followed by a tour of the Centre and demonstrations of the equipment which is on permanent display. Interesting features were the software department, where audio visual aids for education are well displayed, and the library.

The following proposals and suggestions from delegates are now in the hands of the Committee for action:

1. There should be greater co-operation and liaison between official and professional bodies working in the audio visual field; with particular reference to the problems of copyright.
2. There should be more standardization in cataloguing and classification.
3. Some effort should be made to provide courses of specialist training in the handling and documentation of films, filmstrips, tapes, slides, photographs, etc.
4. Consideration should be given to the urgent need for a directory of audio visual holdings, with details of scope, availability, costs of hire or purchase, copyright restrictions, etc., a start to be made by covering the collections of the members of the Audio Visual Group.

The address of the Secretary of the Audio Visual Group, Mrs Janet Andrew, is now: BBC Film Library, Windmill Road, Brentford, Middlesex.

Scottish Branch

Mr J. R. K. Pirie has now retired as Honorary Treasurer of the Scottish Branch and his place has been taken by: Mr W. H. Brown, Moray House College of Education, Holyrood Road, Edinburgh.

FID/RI (Research on Theoretical Basis of Information)

The FID Study Committee 'Research on Theoretical Basis of Information' held its regular meeting in Moscow on 24th–26th February 1970. Present at the meeting, besides Committee members, were FID Vice-President, Professor H. Arntz, FID Secretary-General, Dr F. A. Sviridov and President of the IFLA, Dr H. Liebears.

Papers presented and discussed included 'Big science and problems of scientific information' by Dr A. I. Chernyi and 'The optimum p% library of scientific periodicals' by Mr B. C. Brookes (The British representative to FID/RI). The proceedings of the meeting will be published by the Committee.

Electronics SDI investigation by IEE

With OSTI support, the Institution of Electrical Engineers (IEE) has been investigating the value of an experimental selective dissemination of information (SDI) service in electronics. The initial evaluatory aspects of the study were completed towards the end of 1969 and the service has now entered a cost-recovery phase.

This phase is aimed at bridging the gap between the provision of a restricted free service in a limited field (which was available in the initial phase) and the provision of a generally available commercial service over the complete subject field covered by INSPEC (Information Service in Physics, Electrotechnology and Control). Individual and group SDI services are being offered and, to allow scientists without experience of SDI to evaluate the service at minimum cost, special trial subscriptions are available. For details, contact INSPEC SDI Investigation, Institution of Electrical Engineers, 27 Park Place, Stevenage, Herts.

Symposium on handling of nuclear information

Over 160 delegates from sixty-one countries attended the Symposium on Handling of Nuclear Information held in Vienna on 16th–20th February 1970, organized by the International Atomic Energy Agency.

Topics covered at the Symposium included national and institutional information centres, specialized information centres, nuclear libraries and services, indexing methods and systems, and world-wide co-operation in scientific information. Delegates also heard progress reports on the International Nuclear Information System (INIS) and on the World Science Information Network (UNISIST)

The proceedings of the Symposium, which cover the original texts of the fifty-eight papers presented and the discussion of the papers, will be published shortly. Further information can be obtained from the IAEA, Kärntner Ring 11, Vienna.

Abstracts and Indexing Services joint study

BioSciences Information Service of Biological Abstracts, the American Chemical Society's Chemical Abstracts Service, and Engineering Index Inc., are to carry out a detailed review of the relationships between their publications and services. The joint study, which will encompass the coverage, editorial and indexing policies, and data-recording practices of both the publications and the machine-readable records produced by each of the services, is designed primarily to develop information needed by the three organizations for planning co-operative programmes, reconciling differences in policies and practices, and eliminating unnecessary duplication of effort.

The study will be carried out in five phases:

(1) Identification of the degree of overlap in the lists of journals currently monitored by the three services.

(2) Study of statistically derived samples of citations from the three organizations' publications and services to determine the amount and kind of overlap in document analysis.

(3) Analysis of the differences in the editorial policies and practices followed by each service with regard to the form, format and content of bibliographic descriptions and abstracts.

(4) Analysis of the format, data content and character set of the machine-readable records distributed by each of the services to determine the degree of compatibility among these records.

(5) Study of the approaches used by each service in indexing the same or related concepts.

Work on the first phase was scheduled to begin during the second quarter of 1970. Results will be published as each phase is completed. Further information can be obtained from Chemical Abstracts Service, University Post Office, Columbus, Ohio 43210.

Conference on print for the visually handicapped

The Library Association and the National Association for the Education of the Partially Sighted are organizing a one-day conference on print for the visually handicapped reader, to be held on Wednesday, 28th October 1970, at the Commonwealth Hall, Royal Commonwealth Society, 16–20 Craven Street, London WC2. Further information can be obtained from the Research Officer, Library Association, 7 Ridgmount Street, London WC1E 7AE.

Seminar on computer/microfilm interface

An acronym which appears with increasing frequency in the computer literature is COM, which stands for Computer Output on Microfilm. A seminar on this subject, run by the National Reprographic Centre for Documentation on 30th April, provided a timely opportunity to learn about the new equipment and techniques available.

The first paper, by T. J. Morgan, Consultant in Reprography at the GLC, described a system for microfilming paper output from a computer, using conventional equipment. The remainder of the seminar dealt with equipment that can be connected to a computer, or operated off-line from magnetic tape, to give either graphic or printed output directly on to microfilm.

Equipment of this kind has been in use for several years in special applications, but recently it has become far more widely used. B. S. Harris of BOAC and T. A. J. Battersby of the National Giro described their organizations' systems using COM in this country.

The other speakers at the seminar were from firms which make COM equipment, namely the 3M Co., Recordak Division of Kodak Ltd, Memorex Precision Products, and Datagraphix Ltd.

COM has a number of advantages that assures it of an increasingly important role in mechanized information systems in the near future. The equipment operates at very high speeds (between 10 and 20 times as fast as a line printer), and is thus more compatible with modern computer operating speeds. It provides computer output in a compact, easily handled form. It can also reduce the operating costs of systems considerably, simply by eliminating the need for expensive computer output stationery.

Institute for Scientific Information

Chemical Substructure Index

ISI has announced the publication of a new index designed to enable chemists to conduct manual searches for new compounds containing specified chemical substructures or fragments. Called *ICRS Substructure Index,* the index was formerly available only to subscribers of the *Index Chemicus Registry System (ICRS)* (See *Aslib Proceedings,* January 1970, p. 7), but can now be purchased as a separate publication at $1,000 a year.

The *ICRS Substructure Index* is basically an alphabetical listing of Wiswesser

Line Notation (WLN) descriptions of each new chemical compound reported in ISI's *Current Abstracts of Chemistry and Index Chemicus.* WLN is a code for describing the structure of chemical compounds with unique, unambiguous, linear sequences of letters and numerals. Familiar international atomic symbols, readily understood by chemists, are used extensively as letters in the WLN code.

The *Substructure Index* is expected to cover over 200,000 new compounds during 1970.

Production by photocomposition

ISI are to use photocomposition in the production of their publications in future. The first to be completely typeset photographically will be the 1969 *Science Citation Index* which was formerly reproduced directly from computer printouts.

ISI has been experimenting with photocomposition for some time. It now plans to use photocomposition, where suitable, for production of its *Current Abstracts of Chemistry and Index Chemicus,* for its *International Directory of Research and Development Scientists,* and for parts of its seven *Current Contents* publications.

Further information about ISI services can be obtained from Institute for Scientific Information, 325 Chestnut Street, Philadelphia, Penna., 19106.

The Law Librarian

The British and Irish Association of Law Librarians, formed last year to cater for librarians and others interested in law library work (see *Aslib Proceedings*, July 1969, p. 257), has published *The Law Librarian,* the first British journal devoted to law librarianship.

The journal is edited by Miss Elizabeth M. Moys of Goldsmith's College Library, University of London, and the first issue (April 1970) contains articles on the Liverpool University Law Library and the Statutory Publications Office as well as other features. Subscription to *The Law Librarian* is £2 a year, but members of the Association will receive the three issues for 1970 free. Orders and enquiries about membership of the Association should be sent to Mr W. W. S. Breem, Inner Temple Library, London EC4.

The Association is to hold a weekend conference at Liverpool in September.

New sections of the UDC

Eight new sections of the English Full Edition of the Universal Decimal Classification have recently been published by the British Standards Institution.

The sections are all provided with alphabetical indexes and are as follows: BS 1000 (31) *Statistics*; BS 1000 (36) *Social welfare and relief*; BS 1000 (39) *Ethnology. Ethnography*; BS 1000 (338) *Production of wealth. Production. Trend of the economy. Economic situation*; BS 1000 (339) *Distribution, conservation and consumption of wealth*; BS 1000 (622.1/.5) *Explosives*; BS 1000 (622.6/.9) *Fuels*; and BS 1000 (687) *Clothing industry. Articles of toilet.*

Abbreviation of titles of periodicals

Since the publication of BS 4148 *The abbreviation of titles of periodicals* in 1967, the British Standards Institution has been working in co-operation with the American National Standards Institute (ANSI) to produce a common Anglo-American standard in this field. As a result, BSI have published BS 4148 Part 1: 1970 *Rules* which is in close accord with the corresponding USA Standard (Z39.5), confining itself to the principles by which abbreviations are made. Also in common with the practice followed by ANSI, a Word-Abbreviation List associated with the rules contained in this standard will be issued separately (as Part 2), and this will be updated at regular intervals.

Commission on the Third London Airport

The Commission on the Third London Airport, *Papers and Proceedings*, volume VII, parts 1 and 2, Stage III, Amendments, is available free of charge on application to: The Librarian, Board of Trade, 1 Victoria Street, London SW1.

Letter to the Editor

The author of the letter published on p. 167–8 in the April 1970 issue informs us that inadvertently he was incorrectly designated. The Director of the University of London School of Library, Archive and Information Studies is Professor Arthur Brown, D Litt.

Aslib Directory, volume 1

In the June 1969 of the *Proceedings* we notified readers of a wrong telephone number entry in the *Aslib Directory*, volume 1, which was causing inconvenience to a private household. As this household is still experiencing considerable inconvenience, we urge all owners of the *Directory* to ensure that they have amended page 667, entry number 2507 (Research Association of British Paint, Colour and Varnish Manufacturers) to read *Tel.:* 01–977 4427/9, and *not* MOLesey 1063 and 2202.

BRIEF REVIEWS

INFORMATION SCIENCE IN CANADA. Vol. 1, no. 1, Winter 1970. Toronto, Pendragon House Limited, 1970. $8 per annum.

The first issue of this new periodical has been received by the Aslib library. It is a quarterly publication due to appear in January, April, July and October of each year and concentrates on developments in Canadian information science.

This issue contains seven brief articles, book reviews and a section reporting on current projects in progress. Subscriptions should be sent to Pendragon House Limited, 71 Bathurst Street, Toronto 135.

INTERNATIONAL FEDERATION FOR DOCUMENTATION (FID). Abstracting services. 2nd edition. Vol. 1, science, technology, medicine, agriculture; 284 p; $10. Vol. 2, social sciences, humanities; 92 p; $5. The Hague, FID, 1969. (FID 455 and 456).

The information in this edition is revised up to the first half of 1969 and 1500 abstracting services are covered. The two volumes are similarly arranged and mutually exclusive. The main sequence in each volume is alphabetical by the title of the abstract journal. The details in each entry are in English and include the address of the publisher, date of commencement, price, the number of abstracts per year and the publication delay, the numbers of domestic and foreign journals covered, whether reports and conferences are included, the arrangement, and the provision of indexes, etc. The issue of complementary services such as tapes and cards is noted. Cross references to changed titles are made as well as title entries for services that have ceased publication.

The main index is a listing of titles arranged by UDC. There are subject indexes to the UDC in English, French, Russian and Spanish. There is also a list of titles under country of publication.

This is a most useful guide to the world's abstracting services, although the entry for at least *Physics Abstracts* seems to have been overlooked. Also, the inclusion of indexing services, which once again have been omitted, would have made this a considerably more comprehensive reference tool.

INTERNATIONAL LABOUR OFFICE. Year Book of labour statistics, 1969. (29th issue). Geneva, ILO, 1969. 815 p. 90*s* cloth; 75*s* paper.

The 1969 Year Book presents a summary of the labour statistics in more than 170 countries and territories of the world, derived from information sent to the International Labour Office by the national statistical services or from official publications. This edition includes data on household budgets. For the series presented in the form of index numbers, a new uniform base (1963 = 100) has been adopted in the present Year Book.

UNESCO. Bibliography of interlingual scientific and technical dictionaries. 5th edition. Paris, Unesco, 1969. 250 p. 36*s*.

The fifth edition of this bibliography lists 2,491 dictionaries under 263 subjects arranged by UDC, with more than 200 cross-references. There are alphabetical subject and author indexes. 75 languages are represented and are shown by conventional symbols. Cyrillic characters are transliterated and Japanese titles are also translated. Dictionaries published before 1950 are excluded from this edition. A revision of this important bibliographical source is welcome.

It is obtainable in the UK from HMSO, PO Box 569, London SE1.

PRACTICAL PROBLEMS AND PRINCIPLES OF IN-SERVICE TRAINING

ALEC MARTIN

Department of Employment and Productivity

Paper presented at a One-Day Conference on In-Training of Library and Information Staff, Imperial College, London, 4th March 1970

I AM going to ask you to do something which information staff are often asked to do—two things at once. My group in the DEP is concerned with initiating useful research in training, monitoring it when it is in progress, feeding the results and other information about training into a central classified storage and retrieval system and publishing this information mainly for the benefit of training specialists. More exactly, training specialists are the bulls-eye of our target, but there are many other people such as managers, research workers and information staff who need to keep in touch with training developments.[1] We are therefore not only concerned with training but also with information *about* training and we try our best to apply to our own staff the principles which are being developed for industry at large. We certainly want to avoid the old paradox 'those who can, do; those who can't—teach'. I therefore want you to learn at two levels, about our information service and about the principles inherent in its design.

A systematic approach

One of the main aims of the Industrial Training Act is to improve the quality of training. One cannot know that quality has been improved unless one has some sort of measure of quality levels which existed previously. This means that we have to be as systematic as possible in our approach. The most systematic approach available is of course scientific method and I should like to describe to you how we have used this to build our classification system. You may be relieved to know that I take the view that scientific method is no more than a sophisticated analysis of how we solve problems in everyday life. If we have a problem, we gather relevant facts, we make a guess as to the answer, we try out this guess in practice and thus test the accuracy of the guess. In more formal terms, we collect relevant data, set up a hypothesis, test it and thus assess the value of the hypothesis. If we translate these four steps into training terms we have a picture which looks something like this:

Scientific Method	*Systematic Training*
1. Collect relevant data	1. Identify training needs
2. Formulate a hypothesis	2. Formulate training policy
3. Test it by experiment	3. Implement training schemes
4. Assess value of hypothesis	4. Assess training effectiveness

The social context

But quite clearly we do not go ahead with these four steps without regard to the whole social context in which learning takes place. We can analyse this social context into groups of what I shall call social factors and bring them into a general system which can be represented in a diagrammatic form (Fig. 1).

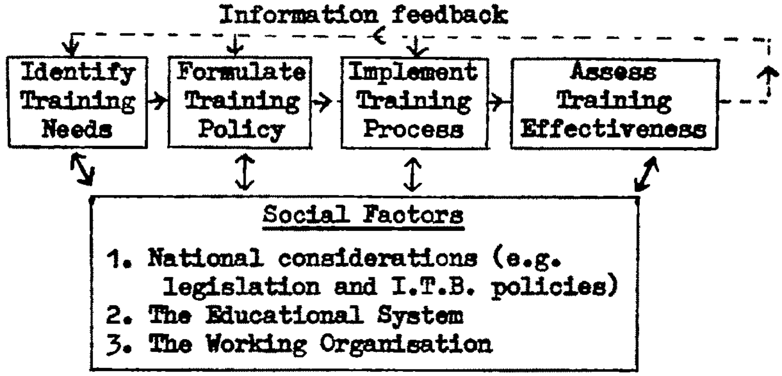
Information feedback
Identify Training Needs
Formulate Training Policy
Implement Training Process
Assess Training Effectiveness
Social Factors
1. National considerations (e.g. legislation and I.T.B. policies)
2. The Educational System
3. The Working Organisation

FIG. 1

I should point out a trap for the unwary by emphasizing that this diagram is merely a representation in two-dimensional form of a process of living and learning; it is a general system which can be entered at any point. Although logically the training specialist starts by identifying training needs, he may well find in practice that this is not the first of his priorities. This outline of what I have called 'the training function' is developed in more detail elsewhere.[2]

Our classification scheme is based on this analysis of the training function. It looks rather like a simplified type of Universal Decimal Classification and has ten main schedules, many of which you will recognize from the diagram. Our annual *Training Research Register* and monthly *Training Abstract Service* is classified in this way, and the scheme also provides training officers with a simple filing system. It is being used by some of the industrial training boards and such organizations as BACIE.

These two publications are linked with the series of *Training Information Papers* which seek to give the results of research in plain words—research workers who write them are asked to do so with a copy of Gower's *Complete Plain Words*, *The Concise Oxford Dictionary* and our own *Glossary of Training Terms* at their elbows. The *Glossary* contains definitions of all the technical terms used in the classification system and it is currently being revised to bring in new shades of meaning which have developed in practice.

Training responsibilities

I hope you will forgive this minor commercial plug, but I think the analytical approach on which the system is based does help us to see where training responsibilities lie. It is only learners who have training needs and in the long run it is only the learner who can do the learning. Training specialists and others are there to assist him. But learning is not a once-for-all matter; it continues throughout working life. Once we appreciate this it is easy to see that every supervisor has a training responsibility and that the training of every supervisor must include 'training' as subject matter. Training is in fact one of the responsibilities of the working organization as a whole and it is futile to draw rigid distinctions between the roles of training specialists and of line managers and supervisors. As I remarked earlier, we try to apply our own principles to our own staff. This means that I have a managerial as well as a training specialist job to do and senior members of my staff are equally line supervisors and training specialists. One of them recently attended a training officer course during which his 'project' was the preparation of on-the-job training programmes for junior staff.

Job analysis

His starting point was job analysis. We shall not get very far in exercising our in-service training responsibilities unless we know precisely what people have to do and what they have to learn in order to do it. One of the simplest approaches is to make a list of all the task items within a job and give each item a score for *difficulty* of performance and another score for *frequency* of occurrence. This score could be 'out of 10' or we might use a simple rating scale of the 'very difficult, fairly difficult, average difficulty, fairly easy, very easy' type. The very easy and rare tasks can safely be left to on-the-job learning but the very difficult and very frequent will require either formal training or special in-service tuition. Job analysis also leads to improved job methods and processes. We find that we can streamline and remove irrelevancies and thus avoid 'training for training's sake'. This certainly proved true in my own group!

Training objectives

We then have to design training for specific tasks. In doing this, we have a series of objectives in mind. One performs a small task in order to complete a more important one, in order to do the job as a whole, in order that the long-term community purposes of the organization are met. We can illustrate the 'serial' nature of objectives by looking at a football team. The centre-forward receives a ball in order to kick it, in order to get it between the posts, in order to score a goal, in order to win the match, etc., etc. We can follow this series through until we ask what precisely are the long-term community purposes of football teams—which are working organizations as much as are productive or service organizations. They exist, as do other organizations, to meet the needs of the total community, of which members of these organizations are themselves members. We thus cannot escape the fact that job *satisfactoriness* is inextricably bound up with job *satisfaction.* And since all managers have training responsibilities they must see that job satisfaction is built into every stage of the learning process.

Self-learning

Those who are not convinced should ask themselves under what circumstances *they* learn best—they learn best when they are interested. Where there is no satisfaction to reward performance there is little interest; where there is little interest both learning and performance are poor. Our basic principle is therefore to involve the learner, to make learning active and rewarding. We can best do this by removing the barrier of anxiety and by showing how learning objectives are related—how one thing leads to another. Build on what is already known in such a way that the next step becomes a challenge rather than a threat.

Training methods

I will only briefly touch on methods of in-service training, since this is to be the subject of the next talk. I would only like to stress some main aspects. First, drawing up duty lists, job specifications, manuals and procedural guides on the basis of job analysis is itself a very good step towards efficient in-service training. Second, and following from this, simple tasks can be performed according to written instructions, 'algorithms' and 'decision trees'. Third, more complex ones need help from the supervisor—and we should not forget that there is very little difference between giving *instruction* and giving *instructions*. Fourth, we should make as much use as possible of modern techniques of programmed and discovery learning. We should arrange the learning in such a way that it is 'self-validating'. That is to say, the learner gets to the final objective by a series of steps and once he has reached that final objective we have evidence that the programme was valid. He knows that he has learned because he knows that he can do the job. Finally—and knowingly to repeat myself—learning is a personal matter. Persons are only persons in so far as they relate to other persons; if we treat our people as people we cannot go far wrong.

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IN-SERVICE TRAINING IN THE ASLIB LIBRARY AND INFORMATION DEPARTMENT

ELIZABETH MACK

Head of Library and Information Services

Paper presented at a One-Day Conference on In-Training of Library and Information Staff, Imperial College, London, 4th March 1970

EARLY in the 1950s, it became evident that the work of the Information Department was so very broad and varied that information assistants with any specialization of subject or language could not be expected to remain in a permanent capacity at Aslib, where their knowledge could not be exploited fully. On the other hand, this very breadth and variety offered an exceptional opportunity to gain experience in using sources of information of all kinds in many different fields. A training scheme was therefore developed for scientists in their first year after graduation. This was before the initiation of formal postgraduate education for information scientists, but the scheme has continued as a practical alternative for science, economics or language graduates who have decided on information work as a career but have opted against following a vocational course. Throughout the 1960s, four Traineeships were offered, for which seventy or eighty applications were received each year.

By an extension of the training to include other new Information Department staff, it was found possible, to mutual advantage, to employ experienced overseas librarians visiting the United Kingdom, for periods as short as three or four months, as temporary intermediate assistants. It has also proved practicable to adapt and extend the scheme to provide, for a fee, individually designed training to individuals from organizations in this country and abroad, who require more intensive instruction in library and information techniques than that offered by the Aslib introductory courses. The training scheme is now applied to all Information Department staff, and a similar programme is in operation in the Library.

The key to the successful operation of the In-Service Training Scheme is the use of an open-plan office arrangement, thus providing assistants of all levels and stages with continuing training by exposure in the operational situation. Although the building at 3 Belgrave Square was not designed for office use, and the second floor where the Information Department is housed was intended to carry only bedroom furniture, it has been possible to remove a partition wall and thus to provide an area large enough for the staff, running from the front to the back of the house. Because of its weight, much of the storage equipment has been moved to the basement, and only the bare minimum of material for daily use is kept against the walls of the room. Staff desks are clustered so that a senior, a junior and a trainee can sit facing one another, and can hear each other's telephone conversations and discuss their work. The clerical staff are included in this open-plan area, although the three clerk–typists are away from eight of the ten telephones. (See Fig. 1.)

The Training Scheme consists of four parts:

1. Orientation lectures
2. Lectures + reading + job instruction
3. Staff-Manual to reinforce 2
4. Learning-at-work

Orientation lectures (see Table 1) last from one to four weeks, depending on the recipient's background. The total formal training may be spread over thirteen weeks, but learning-at-work begins immediately, and lectures are dove-tailed into the work in hand, thus having an emphatic relevance and often being given individually. Each lecture provides a basic elementary theoretical background and explains the application at Aslib. A short reading-list is provided on each topic. The lecture is followed by demonstration and instruction from a senior staff member, and the trainee then undertakes the actual duty under supervision, almost invariably dealing with a current enquiry rather than an artificial exercise. At the demonstration, a photocopy of the relevant Staff-Manual section is provided for personal use, but after this has been discarded, the assistant can still refer to the Manual itself. In addition to the lectures given by The Head of the Department, staff attend selected courses and lectures from those provided for the Aslib Membership. They visit other libraries and information centres in connection with the Aslib courses and also use outside reference facilities to answer enquiries received in the Information Department; in the latter case the first visit is usually made in company with one of the more senior assistants.

TABLE 1. *Specimen lecture list*

1. Aslib Information Department
2. Basic cataloguing
3. Bibliographical resources for checking books
4. Alphabetization. Filing at Aslib
5. Periodicals. Bibliographical entries for articles
6. Journal list, union lists
7. Abstracts and indexes at Aslib
8. Locating periodicals
9. Copyright for librarians
10. Report literature
11. Translations Index at Aslib
12. Reference books
13. National and other libraries
14. Patents
15. Theses
16. Standards
17. Statistics
18. Literature-searching and bibliography compilation
19. Letter-writing and telephone enquiries
20. Business information
21. Company information
22. Marketing information
23. Other non-technical sources
24. Organizations with specialized knowledge
25. History and activities of Aslib

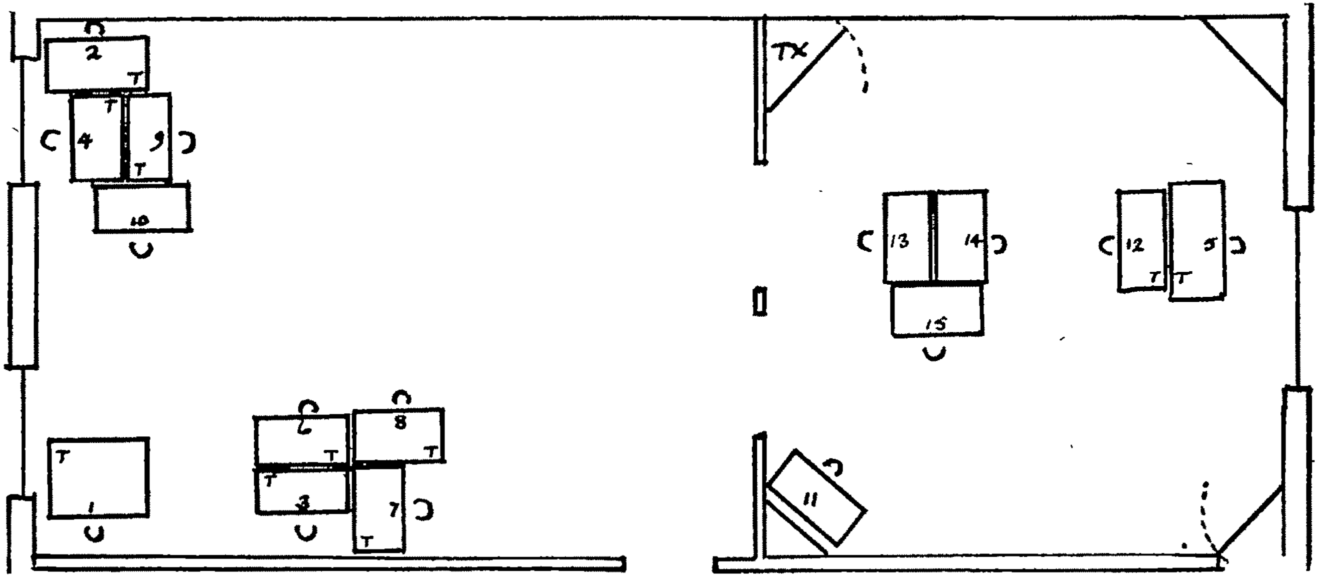

FIG. 1. *Aslib Information Department: Seating Diagram*

STAFF			
Information Officer	1	Juniors	10 11 12 (Trans.)
Seniors	2 3 4 5 (Trans.)	Clerical	13 14 15
Trainees	6 7 8 9	Telephone	T
		Telex	TX

The Staff-Manuals in the Library and Information Department contain standard instructions for routine and clerical procedures, and range from an alphabet and numerals in library-script, through flow-charts for loan-finding, to a description of the other departments at Aslib. Specimen entries are given for bibliographical references, and for all the stationery forms, which have been developed over a period of years so that typing is minimized and can be undertaken by junior clerical staff, or, in an emergency, can be replaced by handwriting. Any change in routine is pencilled in and dated, and from time to time sheets are re-written and re-typed; but the current procedure in force is always clearly recorded in the Manual. (See Table 2.)

TABLE 2. *Aslib Library—Staff Manual, Current procedures*

CONTENTS

A ACQUISITIONS
  i Subject scope boundaries
  ii Book selection
  iii Suggestions

B ORDERS
  i Priced and gratis
  ii Review copies
  iii Incoming orders
  iv Standing orders
  v Scattered articles

C ACCESSIONING
  i Books—pamphlets—series
  ii Minimum processing

D INVOICES
  i Publications received
  ii Prepayment
  iii Deposit accounts

E CLASSIFICATION
  i Authority
  ii Guiding principles

F CATALOGUING RULES
  i Books—pamphlets
  ii Analyticals
  iii Reports
  iv Microfilms
  v Periodical articles
  vi Theses
  vii Specimen entries

G PROCESSING
  i Catalogue cards
  ii Publications

H STOCK CONTROL

I PERIODICALS
  i Registration (with flow chart)
  ii Scanning
  iii Circulation
  iv Exchange
  v Subscription renewal

J LOANS
  i Books—pamphlets—series (with flow chart)
  ii Copies of articles (with flow chart)
  iii Inter-library

K ENQUIRIES
  i Information from stock
  ii Literature searching
  iii Outside sources

L DISSEMINATION
  i Current awareness list
  ii SDI—News flashes
  iii Bibliographies
  iv *LISA* (with flow chart)

M VERTICAL FILES
  i Conference index

N EQUIPMENT INDEX

O FILING RULES

P SHELVING

Q STATIONERY

R POST

S STAFF DUTIES
  i Librarian
  ii Seniors
  iii Juniors
  iv Clerical

T TELEPHONE

U TYPING

X COPYING

Z LIBRARY SCRIPT

Perhaps the most vital point in the whole scheme is the provision for the active head of the Department, the Information Officer, to be seated in the main room with the other staff. The Information Officer's desk is apart from the others—so that visitors can sit and talk in relative privacy—but close to the two main clusters of professional assistants. In the Library, which is smaller, and in which the walls are completely lined with shelves, the staff are in any case closer together, and can communicate without even raising their voices. The Information Officer handles few enquiries personally, but hears what the assistants are doing, and is available for instant consultation and discussion, either with the seniors, or right down to the newest junior clerk-typist.

Every enquiry has a work-sheet affixed; enquiries completed on the day of receipt are not recorded in detail, but are only counted for a statistical record. Longer enquiries, and inter-library loan requests, are given running numbers and are entered in enquiry books. Work-sheets are of different colours to show the type of enquiry, with pink slips to show urgency. All action taken is recorded in detail; the reason for this is threefold: first, with trainee staff it is necessary to know exactly what sources have been checked, and how thoroughly; second, the act of recording the steps taken helps to ensure a relentlessly methodical approach, and also assists in permitting tangential movement to follow up an unexpected lead without losing the sequence of methodical search if a return to it is necessary; third, another assistant may need to handle an enquiry during the first one's absence, or during a visit to an outside library, and it is essential to be able to see what has already been done and with what result. The work-sheet is only used to record the sources used; the results obtained are entered on a separate sheet, or bibliographical references are entered on 8" × 3½" slips (on scrap catalogue cards in the library). These can be sorted, discarded and arranged for a typist to produce a bibliography.

As has been adumbrated, the work is subdivided into sections, each headed by a senior assistant as section-leader, who will make most of the decisions necessary for the group, but will consult, or refer the juniors to, the Information Officer when necessary. Each of the section-leaders has been through the training scheme at Aslib, and usually finds no difficulty in applying its principles in turn to the juniors in the section. Even if the whole department could not be housed in the same room to operate as a total unit with completely open communication between all individuals, a great deal of flexibility and training could result from the preservation of the open plan at the section unit level.

New staff in the Information Department or Library, however senior, must familiarize themselves with the routines and storage locations. They do this by undertaking, if only for a short period, the chores of filing, shelving, recording enquiries and index maintenance. This is partly making a virtue of necessity, as the clerical staff has a high turnover and is frequently not complete, but it is possible to gain much from a short performance of such duties. Filing completed enquiries, for instance, will lead to a knowledge of the Members who use the services; and an index into which entries have been filed will automatically spring to mind as a possible source when enquiries are handled later. There are also certain special projects and indexes for which overall responsibility is delegated in rotation to trainee assistants, who handle any enquiries in the field, as well as organizing the input.

Anonymity is preserved as far as possible in the Information Department and in the Library; assistants avoid giving their names on the telephone except to the point of rudeness, answering only 'Information Department' or 'Library'; all letters carry only the initials of the writer, and are signed in the name of the Information Officer or Librarian. There are several reasons for this, particularly the high staff turn-over resulting from the employment of trainees and others whose service will not exceed one year, and whose names would only become familiar to Members just as they left. The anonymity is also an important factor in fostering corporate responsibility by emphasizing that every telephone call or letter carries the authority of the Aslib department as a whole; this authority is a fact, since every communication is monitored by the section leader who will interrupt any telephone conversation, or by the head of the department who reads the letters before they are despatched. While not intending to eradicate all individuality, a common phraseology has been developed, which is useful in teaching new staff how to convey their replies. For example, assistants learn never to state that they 'can borrow' a publication, but only to offer to 'try to obtain' it. Such 'contingency phraseology' is important in preserving a satisfactory Aslib/Member relationship.

In both departments a special technique has been developed for receiving incoming telephone calls. The switchboard announces the call on the most senior telephone vacant, and the recipient, immediately replacing the receiver, states the name of the caller out loud. If the caller is ringing back or has previously been on the telephone, the assistant already familiar with the enquiry will speak up, or if she is absent or engaged her colleagues in the same section will do so. They can then handle the incoming call since any action already taken on the enquiry will have been clearly recorded on the work sheet. If the caller is ringing back the assistant will have indicated the substance of the reply and any further interrogation that may be necessary. If no assistant responds to the name of the caller, the Head or section leader selects, from general knowledge of the caller and his usual type of problem, a suitable assistant to take the call. The switchboard merely connects the caller to the next telephone picked up within the department without further intervention—thus her work is not made difficult by this procedure.

The fact that all activity is known to all the assistants, at least at section level and usually departmentally, provides for the most profitable cross-fertilization of ideas. Not only can the language or subject expert offer, or be called upon to offer assistance, but a problem may initiate some degree of 'brainstorming' leading to the most effective possible way of solving it. At any time in the department, a relatively high proportion of staff will be less than fully experienced and the vicarious experience gained at close quarters in the section provides an automatic in-service training device from which the alert assistant gains an enormous bonus. Although unconsciously absorbing what is going on all round, remarkably little depth of concentration on the work in hand is lost. Not all individuals can work in this way, but the majority seem able to benefit, and actually to enjoy it.

The Traineeship arrangement emphasizes Aslib's responsibility in educating for information work; and besides training those staff who it is hoped will become permanent, and providing a learning situation for the Graduate Trainees and the short-term staff who fill the vacancies so very usefully, Aslib accepts students for periods of one to three months from Members. From preliminary talks with the Member and the Student, special lectures and supporting reading lists are elaborated. Practical work is provided within the framework of the Information Department and the Library. For Aslib permanent staff, some provision is made for continuing education not only by exposure, but by facilities to attend Aslib and other specialist courses, to make visits, and to see new publications.

The results of the open-plan programme are threefold. To users, that enquiries can always be dealt with at the highest level necessary; when staff shortages and new recruits cause delays, the quality of the reply should not deviate. To the staff of the Information Department and Library, the result is a rapid integration into the service, and a high degree of job satisfaction; the short-term staff in particular, who contribute much to Aslib, quickly feel that they are stretching themselves in a new environment, and that the effective but exhausting work they do is valued and is of mutual benefit. Aslib as a whole gains from the programme by overcoming the difficulties inherent in its activities, which require expertise and intelligence from the staff but offer limited prospects for continued growth. Through the In-Service Training Scheme it is possible to maintain the Information Department and Library teams as active, living, effective entities, because of, rather than in spite of, their constantly changing constituents.

DISCUSSION

MR T. WHITEHALL (Brooke Bond Liebig) asked Mrs Mack if she used flow-charts for library operations other than checking-in material—for instance in connection with which source to go to first for loans. MRS MACK said that flow-charts were used mainly for straightforward clerical procedures; a complex flow-chart, however, was used for *LISA*. The source-seeking procedures in the Information Department were so variable that it was too difficult to have flow-charts for them; each enquiry was handled differently according to the enquirer's circumstances.

MRS M. CLARKE (Welwyn Hall Research Association) asked the speaker if, in a small unit, she considered that the Head of the Department should be in a separate office. MRS MACK said she did not.

MISS SUTHERLAND (Tavistock Institute) asked Mrs Mack if she would clarify Aslib's means of recruitment at different levels of information staff, e.g. were all staff taken on as trainees and then promoted to seniors on merit? MRS MACK said that four graduate trainees were recruited each academic year and were then replaced by four more. Other assistants who came in with 'A' levels could eventually be promoted to senior positions. One problem was that because the enquiries were so varied it made it almost impossible to recruit a pure chemist or someone fluent in German, for example. Generally Aslib recruited all-rounders who could benefit from a general all-round experience of information work. There was no other organization like Aslib which dealt with such a variety of queries and, in this respect, three months at Aslib was invaluable experience to any temporary assistant.

THE SIGNIFICANCE OF STAFF STRUCTURE AND PROMOTION POLICY

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Paper presented at a One-Day Conference on In-Training of Library and Information Staff, Imperial College, London, 4th March 1970

Introduction

YOU have heard two papers on different aspects of training in library and information units. The object of training must be to enable the individual to make a more effective contribution to the total effort of the unit; it is logical to look beyond, to the impact of training and development, to the recognition of the result of greater effectiveness, and to the question of incentive and promotion. This is the purpose of this paper, to consider some aspects of these matters, and particularly the possibility of grading and assessment of library work, and their relation to staff recruitment, incentive, and promotion. It is proposed to look generally at principles of job evaluation for non-manual work, to examine what special requirements there might be in the assessment of library and information staffs, and to outline the provisions of a scheme which could meet these requirements.

I must first explain that I have been a member of a small ICI working party which investigated job designations and grading of staffs in library and information units of the company. I am greatly indebted to the company for permission to include in this contribution a body of material arising from the work of that sub-committee. I must, however, emphasize that this paper is not a statement of company policy, and does not purport to be a presentation of company views. The ideas and suggestions are personal ones, and should be considered as an individual approach to the subject of job assessment in library units.

Secondly, I find, as do so many speakers at our professional meetings, that it is necessary to comment on terminology. It is an old and hoary, perhaps I should say ripe, chestnut, by now: but I shall not subscribe to any precise division between library and information work, between librarians and information officers. I shall use the terms randomly and indiscriminately, and would ask you to consider them as applying to the business of handling knowledge and information in an organized manner, and supplying an information service from a library organized to do this.

General approach to staff job evaluation

Job evaluation has existed as a standard procedure in personnel work for many years, but its applications to creative mental effort has been slight.

The basic methods of job evaluation vary considerably, however, and some preliminary comments on the general approach may be useful to those who have not met the procedure. It may be defined as a method of systematically analysing the content of a job, assessing the requirements of the tasks which comprise it, and using defined factors to grade the job against an established scale. It is based on the idea that a job can be broken down into a number of unit tasks, which can be treated as common units where jobs cannot. The assessment should be capable of establishing requirements analytically and precisely. At this stage it is concerned with a job and not a person; the ability of an individual to meet the requirements can then be considered separately. This form of job assessment offers a method of recognition of significant factors, selected to meet any required parameters, in a manner which the generally practised alternatives, age scales, collective bargaining, market pressures and the impact of supply and demand, cannot do.

There are typically five components of an assessment scheme:

(a) an enumeration of all the separate tasks forming the job;
(b) an indication of the percentage time which each task occupies;
(c) a series of defined factors which are the guides to the overall requirements of the job;
(d) graded definitions of these factors, from most elementary to most advanced;
(e) a points rating system and formula which will relate the results obtained to a grade for which there is an established scale of remuneration.

The assessment would usually be undertaken by a team of assessors, possibly consisting of the departmental manager or his representative, a personnel department representative, a specialist in the particular kind of work being assessed, and an independent assessor in a position to view the company picture as a whole. There should be provision for consultation with the person whose job is being assessed, and for an appeal by that person against the assessment. The figure obtained as a result of the assessment often represents the median of a salary range, the maximum being ideally 30–50 per cent above the minimum, to allow for recognition of experience and personal performance. The assessment or appraisal of individual performance is a separate exercise.

There is a body of Literature on the application of staff job assessment to non-manual work, and some considerable variation in the different approaches. The fundamentals are well covered in Chapter 3 of *Salary administration* by McBeath and Rands.[1] In this the principles are outlined of five basic methods: grade level descriptions; job ranking method; factor comparison; points systems; and time-span of discretion. The points system is probably the most widely used, and its correct application can introduce an acceptable means of assessing relevant requirements which are not otherwise readily measured. In an example of a typical scheme, the authors give a set of twelve factors with their weightings (see top of next page).

These factors are graded into degrees, varying between four and eight, described and defined against progressive requirements, with points rating increasing for each degree. The evaluation procedure for a scheme of this type is described.

One of the best known methods for clerical and office duties is that of the

	Per cent		*Per cent*
Education	12	Responsibility for assets and materials	9
Experience requirement	16	Contacts	8
Supervisory responsibility	10	Responsibility for records and reports	6
Decisions	10	Responsibility for confidential information	6
Supervision received	6	Physical skill	5
Work complexity and adaptability	8	Working conditions	4

Institute of Office Management, originally devised in 1942, and described in the Institute's publication *Clerical job grading and merit rating.*[2] A wide range of office tasks is listed in each of six grades, with concise definitions of each grade, catering for advancing degrees of experience, initiative, responsibility and judgement.

The British Institute of Management has issued a report, *Job evaluation: a practical guide,*[3] which includes notes on a number of schemes, showing the factors used and their weighting. One of these is interesting, in that it recognizes 'responsibility for information and/or cash' as one of its factors.

	Points		*Points*
(a) experience	3–20	(e) supervision	0–12
(b) education	3–12	(f) initiative	0–10
(c) complexity	3–10	(g) alertness	0–10
(d) responsibility for information and/or cash	0–12	(h) co-operation	0– 6
		(i) vision	1– 5

Another interesting feature of this scheme is the emphasis it places on personality and mental characteristics. The term 'vision', incidentally, is related to optical strain, and not foresight!

In another scheme described in this report, twenty factors are used. Seven of these are general; three special requirements relating to executive ability, analytical ability, and development; five describe different kinds of responsibility; and four cover physical requirements. The range indicated by these twenty factors is extremely wide, and it was intended that this scheme should apply to all weekly paid staff.

The National Board for Prices and Incomes has issued a report on *Job evaluation* (reference Cmnd 3772–1),[4] and the supplement mentions a scheme with a rather different approach, again recognizing responsibility for confidential information, although not in this case on the same footing as cash. There are seven defined factors:

(a) education, training and experience
(b) complexity of work
(c) responsibility for supervision
(d) responsibility for resources
(e) responsibility for confidential information
(f) social skill
(g) working conditions

There is no elaboration in the report of the intriguing term 'social skill', or its significance in the assessment scheme.

There is a comprehensive American textbook on the subject, *Job evaluation methods*, by C. W. Lytle.[5] This has chapters on office and supervisory work and on executive and professional positions. There are numerous examples, and I would like to mention one designed for all executive jobs above assistant foreman, that is generally for middle and top management jobs. There are sixteen factors, each graded into different degrees with precise descriptions of the progressive levels. The factors, with their point ratings, are as follows:

Knowledge	240
Judgement	240
Planning	60
Creative work	150
Relationship, inside the corporation	100
Relationship, outside the corporation	120
Line control (supervision)	220
Functional control	120
Policy interpretation	100
Investment of capital in fixed assets	160
Care of corporation assets	120
Confidential information	70
Physical demand	20
Personal hazards	30
Surroundings	20

Notice that knowledge and judgement rate quite highly, that the scheme allows for recognition of relationships inside and outside the company, for investment of capital in fixed assets, and for confidential information, although the latter is at a rating of only 70. I think this particular scheme, comprehensive though it is, highlights the danger of too much detail, and of trying to cover too wide a range of jobs with one elaborate schedule of factors.

There is some division of opinion on the extent and complexity of the defined factors likely to give the most effective job assessment scheme, and some writers have suggested that too much elaboration is undesirable. Having in mind the basic idea of assessing the tasks in a job rather than the personal qualities required for the job, this could be true. It is likely that, as the number of factors to be considered increases, the proportion of them which relates to personal characteristics rather than job requirements will become higher.

But these are really questions for the specialist. I have tried to give you some idea of the general approach, and some examples of the application of different schemes. As I have mentioned, there is much literature on the subject; the report of the British Institute of Management has a useful bibliography, and there is another in the Institute of Personnel Management's publication entitled, *Personnel Manager's guide to job evaluation*, by G. F. Thomason.[6]

Staff job assessment and library work

An important facet of job evaluation is the value, in terms of motivation, of a well-defined career ladder. By nature of the specialized techniques and experience in an information unit, promotional exchange of staff between the unit and other departments of the organization is restricted. Direct promotion inside the unit is likely to be dependent on vacancies arising from resignations and retirements. The trend is generally for professional promotion to be sought by change of employer, with resultant high labour turnover costs for the company. Cost-conscious managements in industry, in any case, keep a wary eye on overheads, and the industrial librarian may find it difficult bidding in a tight labour market against institutions supported by public funds. Against this background, what are the possibilities of a staff job assessment scheme which offers some form of promotional incentive?

I am sure that we all like to think of our own job and kind of work as being rather special, and having special demands and requirements. This is a self-defensive mechanism. Whether or not there is justification for this in library and information work, I am sure that the duties and responsibilities of library staff require a special approach in job assessment schemes. The library has certain unique characteristics. It is a small self-contained unit, providing a service to every part of the parent organization. The staff must be familiar with the whole activity and interests of the organization, and must be prepared to meet the requirements of scientific, technical, commercial and administrative staff at all levels. Each member of the library team has his own routine responsibilities, but will also be required to help, directly or indirectly, in meeting these requirements.

Coupled with this are knowledge and judgement in the efficient exploitation of information, ensuring that the organization receives maximum benefit from its library resources. Additionally, the staff must be able to communicate with any specialist in his own field at a level which will instil confidence, and will encourage the specialist to talk over his problems with the information staff. The specialist may not necessarily be a scientist. The assistant may be called on to deal with all levels of scientific, technical, engineering, production, techno-commercial and economic matters, while still being competent in his own special fields of information handling and processing.

We have seen in some of the examples of job assessment, a factor related to responsibility for confidential information. This is very relevant to the company library, not only in the handling of company reports and documentation, but also by reason of its close connection with and awareness of the company's interests and trends of development. The extensive contacts which an assistant makes, both inside and outside the organization, regularly require a high degree of discretion and awareness of the confidential aspects of what might appear to be routine enquiries.

One final aspect of this question of special requirements relates to the important factor of decision making. Referring back to the American textbook which I mentioned, and the detailed scheme for executive staff, one of the sixteen factors was 'judgement'. This was analysed into seven different levels of decision, each graded in six degrees, to give forty-two different positions at which the decision factor could be assessed, with point ratings between 24 and 240, out of a total possible of 1970. These are generally in the category of management or administrative decisions, such as the librarian might be called on to make in relation to budgeting and expenditure, staff establishment, library operation and planning, and so on. We must consider in addition to these what might be termed 'information decisions' which each of the library staff is called on to make in connection with his routine duties, and which will make their impact on the company functions according to their adequacy or inadequacy.

Consider, by way of example, an abstractor. He is continually concerned with decisions on the overall relevance of information before him, with the particular relevance of a unit of information, the originality of the work, its level of significance, the competence of the authors, and the veracity of the findings or deductions. Parallel problems and decisions are intrinsic in bibliographic work and the presentation of retrieved information. It is this interpretation of decision making and judgement that carries significance in the assessment of a large part of information work.

A scheme for staff job assessment in special libraries

Having given a brief resumé of job assessment techniques generally, and looked at some special aspects of information work, I would now like to discuss a practical approach to staff job assessment in a special library organization. As I indicated at the commencement of this paper, this scheme is closely related to the work of the ICI sub-committee which looked into this matter, and it would be wrong for me to seek credit for the basic ideas which it presents. I must at the same time remind you that this is a personal paper and should not be regarded as a statement of company views.

The working party was seeking to establish a series of standards against which work in the company library and information units could be assessed. It was proposed to do this by listing comprehensively the duties and responsibilities (that is, the tasks) of library staff, and then to group these various tasks into definable 'job units'. The aim was to cover all staff below departmental manager or equivalent, and thus provide a progressive scale, from the performance of routine duties to the most advanced and constructive information work, including administrative and management functions.

In compiling the list of tasks, the tendency was to use reasonably broad descriptions where possible, and only break these down into more specific stages where it seemed necessary in order to obtain an analysis of an integrated series of duties.

The tasks were grouped under eleven headings:

(a) policy and administration
(b) finance
(c) information services (enquiries and reader liaison)
(d) supervision and training
(e) acquisition and recording of material
(f) bulletin work
(g) reports and company documents
(h) purchasing
(i) journal control
(j) book, pamphlet and report control
(k) general

Since staff at a wide range of levels would be called on to do enquiry work, it was found useful to define this particular task in four grades:

(a) Critical evaluation; selective and analytical literature assessments. Screening of enquiry information for security purposes. Extraction of information from all sources, including reports and patents. Preparation of annotated and selective bibliographies. Liaison with outside organizations where necessary.

(b) Compilation of bibliographies from published and internal sources. Literature searches.

(c) Extraction of data from reference and textbooks; advanced bibliographical identification.

(d) Quick reference and textbook enquiries for simple data, including bibliographical details, addresses, personal titles, telephone numbers, etc.

Levels (a), (b) and (c) involved the determination of the correct presentation to the enquirer; work done at each level would obviously cover and include that at the lower levels.

The creation of suitable and acceptable job grade titles presented some difficulty, and a satisfactory sequence of descriptions could not be obtained without introducing terms such as 'library assistant', 'information officer', etc. These were adopted solely for the purpose of grading, and it was stressed that work done in a special library should not be thought of as consisting on the one hand of information work and on the other of library work. The whole exercise did in fact demonstrate the absolute integration of the various types of duty, and the manner in which an assistant's time could be taken up with a wide variety of responsibilities at different levels.

The terms adopted, then, were used as reference standards in the framework of the assessment scheme as a whole. There was no intention that job descriptions already in use, such as abstractor, indexer, enquiry assistant, classifier, etc., should be discontinued, but only that the duties represented by these descriptions should be related to the appropriate grade titles. These were:

(a) principal information officer
(b) senior information officer
(c) information officer
(d) information assistant
(e) library assistant
(f) library clerk
(g) routine assistant

The next stage was to take the complete list of tasks, with the graded descriptions of enquiry work, and relate them to the seven grade titles. An indication was given where a particular task might be done at a higher or lower grade level. This formed the master list against which an individual would be graded, following an analysis of his duties and the percentage time spent on each. It would perhaps be appropriate here to indicate the significance of training and development, since the result should be to increase experience and ability to deal with work at a higher level, and an increased percentage of work which falls into a higher grade. For the scheme to function effectively, it should thus provide for reassessment at regular intervals.

On the choice of defined factors to be used in the assessment, the working party was largely guided by an established company approach to job evaluation. The divergence of approach in this particular stage of staff assessment schemes has already been noted, and particularly the dangers inherent in using too complex a range of factors. Three main factors only were used in this case:

(a) supervision
(b) relationship
(c) decision or discretionary content

Each of these were graded into degrees between 0 and 10, the progressive requirements for each degree being precisely defined. It was thought desirable to consider the particular import of the decision factor in an information context. Decisions would be concerned with search strategies, information analysis, utilization of and research in information, judgement in the analysis of material for information work, planning and evaluation of information services, advisory decisions on consultancy services, and similar responsibilities pertinent to library and information work. With this in mind, the definitions for the higher degrees of the decision factor were phrased to cater for these specific aspects of decision making.

To obtain a guide to the overall grading for each job, the three factors were weighted, with dominant significance being given to the decision factor. Each grade was then related to an established company scale.

A final step was the introduction of a 'box' system, by which each job was covered by a group of three boxes representing three progressive salary bands, with the central one being the band for the assessed figure. The occupant of a post would normally start in the lower 'box', one grade below assessment, and would move through the three 'box' ranges as he gained in experience. Provision might be made for entry at different levels where previous qualification and experience would justify this. Special provision might also be made for the recognition of professional qualifications by transfer to a higher box, where justified by the benefit to the organization.

These, then, are the broad outlines of a method of staff job assessment for a special library and information unit. I hope to have given you an idea of how the unit might benefit from such a scheme; firstly by the introduction of an element of promotional incentive not otherwise readily available in a small unit, secondly by indicating a means of recognizing the benefit from training and development; and thirdly by providing a standard of grading applicable to the recruitment, assessment and progression of new entrants into the service.

No man is an island, however, and no unit of an organization can be considered in isolation from that organization's salary and personnel policies. Nevertheless, I believe it is possible that the ideas here suggested could be introduced within an established company framework without straining such policies. It is certainly axiomatic that no staff job assessment scheme can be effective unless the results are acceptable to both employer and employee.

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DISCUSSION

MR J. DAVIES (British Council, Science Library) asked what sort of turnover there was at IMI. MR BOODSON replied that this was cyclical, i.e. it went in spasms. During the last ten years all but four of the staff had changed and in the last two years none had changed.

MISS C. H. W. BICKLE (Chartered Insurance Institute) asked if the organization found that it was often necessary to replace a member of staff who leaves by a more highly-paid employee in order to fill the vacancy at all and, if so, did this not invalidate the system. MR BOODSON replied that this was a problem but it was rather easier now. He had to maintain a balance by internal promotion and by taking on junior staff.

MR P. O'N. HOEY (J. Lyons) said that in establishing ICI/IMI's 'box' gradings Mr Boodson appeared to base staff incentive schemes only on well-defined salary scales. MR BOODSON said that they had tried to provide an incentive for people to stay, and to promote people to a higher scale where it was appropriate. But there inevitably came a time when a person must move in order to obtain promotion.

MR S. R. LOYNES (Wiggins Teape) mentioned that, on investigation, heavy staff losses were due partly to unequal salary structures in local comparable special libraries. Through personnel offices of relevant companies, his firm had obtained their salary structures for library and information staff. It had also obtained local public library scales and from there it had worked out a new salary structure based on experience, qualifications, special abilities (i.e. languages, etc.). This new structure had been accepted by his company and by some, though not all, of those who submitted their scales. He anticipated that this procedure would stop 'pirating'. MR BOODSON asked if Mr Loynes thought the pirates would co-operate. He thought it was a fine idea and would like to know on what standards the assessment was based.

CO-OPERATIVE SCHEMES FOR IN-SERVICE TRAINING

D. I. COLLEY

City Librarian, Manchester Public Libraries

Paper presented at a One-Day Conference on In-Training of Library and Information Staff, Imperial College, London, 4th March 1970

TEN YEARS ago, Professor McGregor of the Massachusetts Institute of Technology published a book called *The human side of enterprise.*[1] In it he described two theoretical assumptions of management, the old and the new. The old, he called theory X. In brief, theory X states that man is essentially lazy; carrots and sticks are required to get him to work at all; man lacks initiative and will do everything possible to avoid responsibility. The new, McGregor called theory Y. Theory Y states that work is natural to man; man will work hard; and will seek responsibility and show considerable initiative in the service of objectives to which he is committed.

Five years after McGregor, Professor R. R. Blake of the University of Texas described a method for identifying various styles of management. Managers are concerned with production. Their degree of concern for production can be plotted on a horizontal axis divided arbitrarily into a nine-point scale. Managers are concerned to achieve production through people. They are concerned with people, and their degree of concern can be plotted on a vertical axis, again divided into a nine-point scale. Using the grid so formed it is possible to identify eighty-one combinations of concern for production and for people. Let us look at five of these. The 1 : 1 manager has the minimum concern for production and the minimum concern for people. He does the minimum which is required of him to maintain his membership of the organization. His shoulder is seen to be at the wheel, but he is not actually pushing. The 9 : 1 manager has maximum concern for production but very little concern for people; to him, people are machines and he drives both people and machines indiscriminately.

His opposite, the 1 : 9 manager, believes in a happy ship, people are all-important, production looks after itself.

Appropriately in the middle, is the manager of compromise, the 5 : 5 type. He realizes that he has to have a certain amount of concern for production. He appreciates that people count too, but his concern for people and production tends to be governed by precedent and the book of rules.

The 9 : 9 manager is the goal to which we all aspire. This is the man who accepts the underlying assumptions of McGregor's Theory Y. He sees in people a need to be involved in and committed to productive work. He places a high value on performance and on performance improvement so that both personal and organizational growth can be achieved. He aims to arrive at sound creative decisions that are understood and accepted by everybody concerned. Where a number of people have something to contribute to the decision-making process, he looks for a team solution to problems.

Training is a line responsibility, and the characteristics of the different managerial styles are as apparent in a manager's attitude to training as they are in his general approach to the managerial function.

The 1 : 1 manager wishes to avoid being involved in training. Training is someone else's responsibility. After an uncomfortable three minutes with a newcomer to his section, he will probably call in a subordinate and say, 'By the way, this is Joe Spinks, take him away and show him what to do'. He will welcome with open arms the appointment of a company training officer and he probably thinks that co-operative training schemes are sent by heaven to get him off the hook. There is a 1 : 1 managerial type in charge of training for a fairly large organization in the Manchester area. His approach to training is known by his trainees as the 'mushroom' technique. When asked to describe it, they will say that they are kept completely in the dark, except that every now and then, someone opens the hatch and throws manure on them!

Maximum production is the concern of the 9 : 1 manager. People are tools. If he can get a better tool he does so. If he can't, he takes those he has out of the production line one by one and sharpens them up. He may make use of the training officer, and if he does, the training officer had better produce the goods, and if production figures are not up in the next quarter he will want to know the reason why. A typical 9 : 1 manager told me that he had appointed a training officer. 'Why?' I asked him. 'I thought you didn't believe in training?' 'I don't,' he said, 'but we paid X thousand pounds last year to a training board so that those lay-abouts can set up plush offices and issue fancy brochures which no one reads. So I appointed a training officer and when he turned up on his first day, I said to him, "Now, I don't want any fancy ideas. Your job is to maximize the grant to this company from the training board with the least possible interference with production. You understand? Well, go to it" '. This is known as management by objectives.

The 1 : 9 manager's approach is very different. 'By the way, old man', he says, 'you've been looking a bit peaky recently. I've put you down for a course. It will be a nice change for you. You'll meet a jolly nice set of chaps. The food's quite good. Well, have a good time, and don't overdo it. Oh, by the way, take a hot water bottle with you, the billets are a bit cold at this time of the year'.

Accepting the assumptions underlying MacGregor's Theory Y, the 9 : 9 manager sees in people a need for involvement and commitment. He will be aware that training is a continuous process, that training and personal development are continuous processes, and that at any time, in any organization, everyone from the top brass to the most recently appointed sweeper is in need of education, re-education, training and re-training.

In his approach to training, the 9 : 9 manager will have in mind that the organization exists to satisfy human needs. These needs are not exclusively the needs of the share-holders, or of management, or of the workers, or of the customers. They are needs which all these groupings hold in common.

You probably remember Maslow's pyramid of human needs. At the base of the pyramid are the physiological needs: the need for food, for drink, shelter, rest and sexual gratification. On the next step of the pyramid are the safety needs: the need for protection from physical danger, economic security, the preservation of the familiar, the establishment of order out of chaos. A step higher up are the social needs: the need to relate to other people, the need for acceptance by various groups, the pressures to conform to the mores of a group to which one aspires to membership. Still further up the pyramid are the needs for esteem: self-esteem, the desire for the esteem of others, status and prestige. Right at the top of the pyramid are the needs for self-realization, self-fulfilment.

Human beings are 'wanting' animals. Maslow believed that their needs could be arranged in this hierarchy of importance. As wants and needs on a lower level are met, those wants and needs on the next higher level begin to make themselves evident and demand to be satisfied. Anyone's driving force, their motivation, derives from unsatisfied needs. Satisfied needs are no motivators. Let us see how this links up with training.

The 9 : 9 manager is aiming for commitment; commitment to training. He wants this commitment not only from line management but also from the trainees themselves. It is obvious that if training is to be productive, the trainees must want to be trained. They must see as the end product of training the satisfaction of their own as yet unsatisfied needs. Looking at Maslow's chart, we can see that in a modern society the needs at the base of the pyramid, the physiological needs, are, generally speaking, satisfied. Society has taken away from the individual the responsibility for seeing that he is clothed and fed and sheltered. Society has ensured for the individual that he lives in an ordered and reasonably stable society, that he is progressively more and more safe from dangers.

These needs are satisfied. They are no longer motivators. It is when we come to the third stratum, the social needs, that training enters the picture. A recruit to an organization is seeking membership of a work group. Acceptance by that work group depends on his conforming within a reasonable space of time to the mores of the group. Among other things, for example, his work performance, in quality and quantity, will have to equate with standards that are acceptable to the group. He achieves this conformity through training. You will see in this a very strong substantiation of the argument that training is a line responsibility, with the line stretching all the way down to the foreman or supervisor level. It is unlikely that any centralized training scheme will produce individuals whose work standards will match precisely the different standards of all the many work groups which together make up an organization, and it does not matter whether that organization's role is manufacturing, or selling, or providing a service.

The connection between the ego needs, esteem needs and training is very apparent. The need for self-esteem is a great motivator. To know that you can perform a task with skill and competence, to feel that you have achieved something in so doing, to have your personal work recognized, to be known to management and to your peers as a good performer, to be accorded status and prestige within your group because of your abilities, are needs which are present in everyone. Satisfaction of them must be based on a very solid foundation of achievement. It is up to management first to recognize that the need exists, and then to ensure that training is so planned that not only does it provide the skills for the satisfaction of these needs, but also that it can be clearly seen to do so, in that the achievement of these skills is rewarded.

A great many jobs in a modern industrial society are bound to be unattractive in that the demands they make on people are so limited that they present no challenge; they provide no new experience. The fullest extent of a person's resources is not required to perform them. People find themselves in an arrested state of development, going round and round half way up the pyramid, satisfying over and over again the need, for example, for acceptance by a group, going from job to job to job because they like to exercise their skills in being accepted by different groups. One finds the people who go moonlighting in the belief that a bigger car, or a bigger house, or a fancier cocktail cabinet or a more distant holiday will buy them the self-esteem they are looking for, perhaps not even realizing that what they are in search of is self-fulfilment: the need to realize their full potential.

There are at the moment three factors which are exacerbating this situation. The first is the disappearance of the Puritan ethic; to WORK is no longer a virtue. The nobility of work which motivated a previous generation to thrift, diligence, and punctuality, no longer operates.

The second factor is the changing climate of our system of formal education. The trend in our schools, colleges and universities is toward giving the individual greater freedom and initiative, the constraints of rigid, arbitrary, externally imposed academic standards are disappearing. The 11+ has gone; O-levels are on the way out; the value of A-levels is beginning to be doubted. Even the system of examining formally for a degree is under some considerable pressure. Formal education is becoming more and more orientated towards the needs of the individual for self-development and, moreover, outside the school and work situation, an individual's unstructured time is increasing and society is making growing efforts to help him to use this time for self-development through adult education in all its many forms: the various clubs, associations, recreational facilities and so forth, that modern society is throwing up, including, of course, efforts like the proposed Open University.

Because of this changing climate, more and more people are expecting to find in their working environment the satisfaction of their need for self-development. And if this is not forthcoming from your organization, they will add to your turnover figures, or to your industrial disputes, or to your figures for sickness or absenteeism.

The 9 : 9 manager is not content to train solely for increased efficiency or increased production. He appreciates that the greatest resource he has is the untapped potential of the individual men and women who constitute his work force. His training programme is designed to release this potential. It is designed with the aims and objectives of the individual in mind, as well as those of the organization. Who knows best the aims and objectives of the organization? The manager. Who knows best the aims and objectives of the individual, apart from the individual? The manager. Who can identify with the greatest precision the training needs of the individual? The manager. Who is best fitted to design and direct a training programme for his staff? The manager.

It is attractive to think of co-operative training schemes. They have their place, and so have any courses external to the work situation. Almost inevitably, however, an outside course will produce a degree of frustration and dissatisfaction. At its most mundane level, every time you send somebody on an outside course, you place your turnover figures at risk. There is a very simple formula which illustrates why. When you send someone on a course, you want to change that person's behaviour, and you think the course will help. Behaviour is a function of personality and environment. You want to add to that person's distinctive personal characteristics—the P element—a skill or skills demanded by the environment, that is the work situation, and a skill which in that environment will produce the desired behaviour. On an external course, the first thing you note is that the skill is acquired in an environment different from the working situation. Moreover, only in the most carefully controlled circumstances is it possible to ensure that the acquired skills and attitudes are precisely what you require. Any deviation reacting on the environment which has remained static while the person has been away, can give you problems, problems of behaviour which in extreme, though not uncommon, cases can lead to frustration, resignation and the departure of the person concerned to seek a more compatible environment.

A simple example may help to illustrate the problem. Supposing your work situation demands a typist capable of typing sixty words a minute, and the only one you have been able to get hold of can type, at the moment, at forty words a minute. If you send her off on a course exclusively devoted to typing you may achieve your objective. She may come back with a speed of sixty words per minute. Fine. But supposing the only course which is immediately available to you is a secretarial course, three-quarters of which is devoted to typing. It is true she may well return with a speed of sixty words a minute. She may also return bubbling over with a new approach to the filing and storage of your office papers which is quite incompatible with your work situation.

You may describe yourselves as librarians, as information officers, as editors, or whatever titles your firm has given you to add to your self-esteem, but in the eyes of your staff, you are line management, and training is your responsibility, and it is from this basic premise that your approach to co-operative training schemes should begin.

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DISCUSSION

MR R. HOWLEY (Lambeth) asked Mr Colley if his library now employed a training officer. MR COLLEY said it did not, at the moment. Manchester was the first library service to appoint a training officer, but he had seen the error of his ways very quickly, so he had changed the title to 'Chief Assistant: Staff'. He controlled all the personnel function that was necessary for him to control. MR HOWLEY asked if he was given any responsibility for training. MR COLLEY said one had to be very clear about one's terms. He did not like the term 'responsibility'. Responsibility was a bit like the widow's cruse of oil. One could say that Mr Colley was 'responsible' for the Manchester Public Libraries. He could delegate responsibility to the next level, but in doing so he had not decreased his own responsibility; he had simply increased theirs. Responsibility was not quite the right word; he preferred to use the word 'accountable'. The Chief Assistant: Staff was accountable to him for the training which went on in the Manchester Public Libraries. But this did not mean that the Chief Assistant did it. It was line management's responsibility, and if line management fell down on the job, it was up to him to train line management into accepting their accountability. MR HOWLEY asked what would happen in the situation if, say, in a four-tiered organization, he considered, as the City Librarian, that tier three needed management training, but tier two in fact did not believe this and disagreed with him here. Who would have the right to go in there? Would he force tier two to accept his view, or would he tell the training officer or the training people to go in and train number three? MR COLLEY said no, he would not. Any training of any description at whatever level was more than what it purported to be. He described an exercise his library was doing which was called, ostensibly, 'training of supervisors'. Generally speaking, in libraries there was no supervisor rank, and the supervisory duties which had nothing to do with librarianship *per se* or information work *per se* tended to be spread out. They had adopted the following process: Mr Colley and his staff officer listed seventy-five areas in which a supervisor could conceivably be expected to operate. They then interviewed all the managers individually, and on each of these areas they asked them two questions: 'Does your supervisor do this at the moment?' and 'Should he do this?' These were uncritical questions; it was simply a fact-finding exercise. They received two answers which they then built up on a chart to show the difference between the answers to the two questions. As a result of asking these two questions light began to dawn in the managers' eyes. Each and every one of the managers interviewed went out with the feeling that there was a great deal more he could delegate. Now they had not told each manager that there was much more he could do; that job descriptions should be a little more specific. Each one had come to this conclusion himself during the course of the interview. They then interviewed all the supervisors (the managers knew they were going to do this) asking them the same questions: 'Do you do this at the moment?' 'Should you do this?' with a very similar result. They then ended up with four different profiles: what the managers thought the supervisors did; what they thought they should do; what the supervisors thought they did; and what they thought they should do. So they then got together small groups of eight, four supervisors and four managers, and showed them the consensus of opinion. Once one knew, therefore, what the organization required supervisors to do, one could then look at their existing supervisors, match them up against this profile of what they should be, and the gap between them was the training need.

MISS C. H. W. BICKLE (Chartered Insurance Institute) said that she did not quite see how Mr Colley had jumped from the idea that people wanted self-realization in their work—which was true—to the idea that a lot of jobs in modern society were devastatingly boring. Just because one could motivate a typist to be a secretary, could one also motivate a copy typist to want to stay until she was a really good copy typist? MR COLLEY said that there were a number of extremely enlightened firms, e.g. Phillips Eindhoven and ICI for example, who were doing a great deal of extremely interesting work on what was sometimes described as 'job enrichment'. He had yet to come across an example of a job which, whatever it was, could not be enriched by using the ingenuity and the creativity of management. It was unreasonable to expect a typist to sit down in a cataloguing department and do nothing but type catalogue cards all day. She could be given a money incentive but this was really only part of the motivation principle. One had to give her work which was worthwhile and which she felt to be rewarding of itself.

GENERAL DISCUSSION

CHAIRMAN:

L. J. ANTHONY, ASSISTANT DIRECTOR (SERVICES), ASLIB

One-Day Conference on In-Training of Library and Information Staff, Imperial College, London, 4th March 1970

MISS B. H. J. SANTS (British Petroleum) said that the speakers had mentioned progressive ladders of promotion, but in most library and information units the staff were divided into professional and non-professional staff. How did the platform suggest that by pursuing a policy of training aimed at developing the individual's talents one could continue to motivate by job-satisfaction when the opportunities for promotion were bound to be limited?

MRS MACK said that, at Aslib, where a person had proved her worth and was felt to be worth keeping, nobody then questioned whether she was a graduate or an ALA or not. If Aslib wanted to keep her, it could usually find a niche for her. She did find that the length of experience at Aslib overcame nearly all the other defects, certainly any defects in education.

MR BOODSON said that one approach to this question related to our own professional qualification, where there would generally be two or three niches in the organization which could best be filled by people with Library Association or equivalent professional qualifications. Now these were the difficult ones, because if one employed somebody who had the expertise that was needed for operating the Universal Decimal Classification, it was then very difficult to devise a training scheme which would allow him to do information abstracting. The only answer here was to build up his experience in other fields until he could be transferred to another type of job; and one then appointed in his place a professionally qualified person, a chartered librarian, capable of taking over the UDC work. But as regards the other types of professional qualification, graduates doing scientific work, he thought it was possible to train people who had in fact not attained that level of professional qualification which allowed them to do that kind of work at the same level. This may take three or four years, but it was possible. With an abstracter working on a scientific bulletin, for example, the ideal here would be somebody who knew that subject and the whole field covered by the bulletin, at an intensive specialized level. But his work at that level should be supported by somebody at a lower level, at two lower levels in fact. The lowest of all was the clerical one, but between that and the highly specialized, skilled expert abstracter there was an intermediate level where the abstracting work that he did would not be as demanding as the top level; but as he or she gradually did that work, he would acquire sufficient background knowledge to be able to do it at the top level. As regards remuneration, this was where the advantage of a graded scheme with a range of boxes came in, because the intermediate person then entered at an intermediate grade, at the lowest level of the box. Perhaps over a period of five or six years, as his experience developed, he would move through the three grades to the top level of the top box. He could then be transferred to the next grade and do the more advanced kind of information work, and start at the lower level of the lowest box in the upper grade.

MR COLLEY said that, as far as he was concerned, the reason for paying people was for doing a job. Now every job had three elements: the technical skills which were required to do the job; the administrative skills which were required; and the social skills. He was most interested in Mr Boodson's description of the ICI scheme because it seemed to him that they had recognized this, and that they were deliberately pursuing a policy of developing people along these three lines according to their potential, and in fact paying them accordingly, regardless of whether they could tack letters on after their name or not. There was no virtue in being a graduate; there was no virtue in being a chartered librarian, of itself. It had to be related to the job one was called upon to perform. As far as the intermediate grade of staff was concerned, he realized the constraint on employers but he did not see any way round that constraint.

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MR D. E. H. REEDER (BISRA) said that, in a small unit, if one had three members of staff and one left this reduced the unit to two. He asked, therefore, if the speakers had any advice to offer on how to train the newly appointed third person without reducing the working strength of the unit to one during the initial training period.

MR COLLEY said that this point was very important. He had hoped that this was the message he had got over in his paper, namely, that if one was in charge of a small unit of only three people then it was the head of the unit's responsibility to train them; this was one's responsibility as line management.

MR BOODSON said there would be a similar situation if a member of one's staff was away ill for four or five weeks. One had to accommodate this situation and this, surely, was a question of progressing the work. He did not think that any library/information unit he had ever been in, and certainly none he had worked in, could say that 100 per cent of its staff time was occupied all the time. One had to have elasticity otherwise the unit would get bogged down. MR REEDER questioned whether all units were not, in fact, bogged down. MR BOODSON said that this was not really so, in their essential day-to-day work. There were cycles of 110 per cent capacity and cycles of 90 per cent. One should make sure that when one was in one of the 90 per cent cycles then that was the time to do one's training.

MR COLLEY said that every manager he had ever met would always say he had no time to spare. Twice a year the heads of all his sections, thirty-six of them, were sent away for a three-day residential course. Now this was forced delegation. They were not allowed to contact their units. When they got back they were astonished. All the most interesting things which had been left in their in-trays had been done. There was only routine work left which anyone could do. Now one only needed to do that once or twice and the lesson was learnt. The section heads suddenly realized they should delegate their work.

MRS MACK said that the solution to Mr Reeder's problem depended on which of the two people had been replaced. Presumably the one who remained had had a certain amount of experience anyway and if this person was given slightly more responsible jobs than he normally did, the Head could start to teach the new assistant what to do, and could then do the lowest jobs which were left personally, in about a quarter of the time.

MR ANTHONY said that people obviously worked at different speeds, but one could not work at the absolute top speed within one's capacity for the whole time, hour after hour after hour. So over the year one presumably worked at some kind of average. There were times when one worked below this average and times when one worked above it; and the time when one had to work above it was the time when this sort of problem occurred. This was really the sort of solution that most people had to produce.

MR COLLEY said that some of his units were of course very small, perhaps only three or four staff, and the forced delegation he had mentioned above also worked there. What he suggested was that next time one had a vacancy in the lowest grade of the three, and one had found a replacement, instead of training him one should go away on a fortnight's holiday. One would be amazed at the results!

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MR S. R. LOYNES (Wiggins Teape Research and Development Limited) asked the speakers if they had any suggestions to offer with regard to overcoming an 'anti-training' trend among library and information staff. He said that his company had decided to go over to metrication on 1st June 1970 and that a training programme had been worked out. There was considerable opposition to it, however. The staff felt that they did not need to know about metrication or would rather learn it in their day-to-day activities, such as when shopping, etc.

MR COLLEY said that he would have to give another paper in order to answer this question. This was an extremely complicated and difficult problem and he would not presume to answer it off the cuff. What was involved here was people's inborn resistance to change. This resistance had to be tackled at the grass roots and had nothing to do with metrication as such.

MR ANTHONY asked if anyone else had experienced the kind of problem that Miss Sants had been talking about. There was a fundamental problem here concerning what she called the middle range of staff, the people who are below the professional but above the clerical levels. This was not just a problem of training, but one which seemed to be developing throughout the library and information world, in that the educational establishments, the library schools and postgraduate courses and so on, are concentrating on turning out people who, in the end, are going to enter the professional grades and senior management; while the supplies, for instance, of the people in these middle lines seemed to be getting smaller and smaller, and more difficult to replace. After all, these were the people who did the work. He asked if this was something that people were generally worried about.

MR COLLEY said this was fundamentally a problem of organization. It was really the professional technician who lodged in the middle grades. When one entered a firm at the bottom one spent most of the time on clerical, routine jobs relating to the profession at minor levels. As one moved up the hierarchy the professional content of the job tended to grow. When one reached the middle grades one was at a period in fact during which more time was spent on professional work using professional skills than at any other time during one's life with the firm. As one reached higher grades it was one's managerial skill which continued to grow. The problem therefore was not the barrier which prevented those in the middle grades from rising higher; it was that the organization demanded that the professional exercising his professional skill only should not be promoted above that level until he had been trained as a manager, since he was being promoted above that level, not for his professional competence and skills, but for his managerial ability.

MR ANTHONY said that, with all due respect, he did not honestly think that Mr Colley's analysis was entirely complete, because what was happening was of course that these people marked 'P' were coming in at the level in the middle, from their training grounds, their schools and so forth. When they came in at this level, what happened underneath was that a kind of 'vacuum' was created because people were leaving and were not being replaced, since there was no one to replace them. Where did one recruit these people from, and what did one offer them when one had got them? This problem was not being solved at all, and it did not apply just to special libraries. There was a similar situation in the universities, for example, where the under-privileged class was the professional librarian who had not got a degree, who was the middle grade, between the people with the degrees at the top, who went on to become deputy university librarians and university librarians, and the clerical staff at the bottom. In between there were the professional librarians without degrees, who could not be promoted. This situation was causing a great deal of concern to a number of university librarians. He had been asked by one of them, for instance, 'Is there anything we can do for these people? Could we somehow produce courses that would increase their knowledge of chemistry or physics?' Now the answer to this was another problem. The real problem was whether one wished to do this in order to improve the competence with which the man worked, or just in order to give him a piece of paper which would enable him to progress. The answer to this was not easy. But the problem was not being solved—this was the worrying thing.

MRS MACK said that to a certain extent this problem forced one to examine the clerical procedures to see if they could be streamlined and eliminated where they were unnecessary, because there were just not enough people to do them.

MRS B. GREEN (St Albans College of Further Education) said that the City and Guilds Library Assistants' Certificate did attempt to fill the gap between professional and junior non-professional levels of staff by adequate training and education of the non-professionals in their practical work. With the certificate, some companies and authorities were awarding financial recognition, therefore raising or promoting the assistant over a work bar.

MR BOODSON said he thought this was meeting a very important need because there were so few industrial employers who were prepared to release their staff full time to study for the LA exams, when they could accommodate single day release during the year for City and Guilds courses.

MRS C. M. CLARKE (Albright and Wilson) said that, referring back to the point raised by Miss Sants, her firm had had a similar problem recently. About three months after recruiting their graduates they lost all three for various reasons. They came across a young lady who had done one year at Manchester University reading chemistry, but for personal reasons had decided not to continue the course. Mrs Clarke interviewed the girl herself, and found that she had an IQ equivalent to that of the graduate staff. She did not have the full chemical knowledge they had, but she certainly had enough potential. Mrs Clarke persuaded her management to employ this girl to fill one of the graduate vacancies, but they had balked on the question of title. The management had said that it could not give an assistant information officer grading to a non-graduate. She was now in a position where she had a very good information assistant who was doing a graduate's job and taking on more and more managerial responsibility, but who was in fact graded lower than her other graduates. Mrs Clarke was, at the time, fighting against management to get this girl upgraded to information officer. She thought she was winning, but, although she recognized that there must be certain standards of education, qualifications, etc., which were acceptable, it was necessary to make management realize that there were many people who had management potential but who had not got the right paper qualifications.

MR BOODSON fully agreed with her and said that it should be possible to put forward a really watertight case to her management and wean them away from the idea that the paper qualification was the be-all and the end-all of all qualifications.

MRS CLARKE went on to say that when she had first joined the company, the information staff had been regarded as employees of very mediocre status, and she had fought then to get them recognized as having the same status as the research staff working at the bench. The difficulty now was that, having fought for this, and having upgraded the majority of staff to graduate level, she had now taken on non-graduates.

MISS SANTS said that having spent a great deal of time on trying to upgrade one's staff one may then have to fill a particular vacancy with someone who did not meet the specifications laid down, and in doing so one may be undoing all the work one had done on upgrading the staff in the first place.

MR ANTHONY said that management must be more flexible in these situations and should be prepared to face the fact that these vacancies had to be filled, and if no one could be found to meet the specifications then one had to make do with the best one could get.

* * * *

MR B. S. NUTTALL (BPB Industries (R & D) Limited) asked if any of the speakers had any experience of, or view on, staff appraisal schemes, where the manager was responsible for appraising the staff under his control once or twice a year.

MRS MACK said that Aslib had no formal appraisal scheme of that kind. The fact that they had been in Aslib more than a year and had experience of the job, and had met some of the members and so on, made them worth keeping on this experience alone. But Aslib was in an exceptional position, partly because of its very general, broad activities, which meant that one could not attract a person with a specialized subject qualification.

MR COLLEY said that everybody appointed to his staff was appointed on a probationary period of six months. There was a form of appraisal at the end of six months but nothing more. It was not only an appraisal of the recruit, it was also an opportunity for the recruit to appraise the job. But their most valuable appraisal was the exit interview. When anybody was leaving them, for any reason whatsoever, he or she was given an exit interview. This was most revealing, and it was most useful to management.

MR ANTHONY said that many people in the Civil Service and other organizations in which staff reporting schemes were in use felt that the system was more a test of the qualities and characteristics of the reporting officers than of those being reported on.

CURRENT AWARENESS LIST

Recent additions to the Aslib library catalogue are broken down into twelve broad groups, whose coverage is indicated below. These groups are not mutually exclusive but it is hoped that users will find them helpful in scanning for new items of interest.

Note: These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory.

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres; management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

ELIZABETH MACK
Head of Library and
Information Services

CURRENT AWARENESS LIST

*Items are available in the Aslib Library and may be borrowed unless marked * to indicate reference copies.*

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MEDICAL TRANSLATIONS. S. M. Bonnekamp, FIL, Member of the Translators' Guild (Med., Science & Lit.), 27 Firs Close, Muswell Hill, London N10. Tel. 01-883 3962 during office hours. After office hours automatic telephone answering machine will record messages.

BUILDING AND CIVIL ENGINEERING TRANSLATIONS from Russian and German into English. G. L. Cairns, MA, 92 Southwood Lane, London N6. Tel. 01-340 8990.

TECHNICAL SWEDISH, DANISH, NORWEGIAN translated by J. T. Craddock, B COM, FIL, Ekard, Ray Park Avenue, Maidenhead, Berks. Maidenhead 24931.

RUSSIAN/ENGLISH TRANSLATIONS. Chemistry, electronics, mechanical engineering. Twenty years' experience Government Department. A. de Merindol, 19 Ingelow House, Kensington, W8. 01-937 6788.

JAPANESE/ENGLISH, RUSSIAN/ENGLISH translations. Chemistry, medicine, biology, zoology. D. A. Fraser, BA, MIL, 22 Gresley Road, London N19. Tel.: 01-272 5664.

WILFRED E. GOODAY, ARSM, DIC, C.ENG, MIMM, FIL. Member of Translators' Guild, Romanian and French. 161 Rivermead Court, London SW6. RENown 1912.

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TECHNICAL AND COMMERCIAL translations from English into Russian. Mrs O. Linsley, 31 Parke Road, Barnes, London SW13. Tel. 01-748 8822.

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TRANSLATIONS: TECHNICAL, SCIENTIFIC, all west-European languages. J. Smuts, B SC (ENGINEERING), FIL, 12 Thorndene Avenue, London N11. Tel. 01-360 7723.

TECHNICAL OR COMMERCIAL translations into/from English, German, Dutch and French. A. M. H. Speller, FIL, NGV, 6 Lakeside, West Ealing, London W13. Tel. 01-998 1045.

TECHNICAL TRANSLATIONS in all west European languages. Electronics and other special fields. Camera copy, printing. Peter Suchodolski, FIL (ENG), 70 Greenfield Gardens, London NW2. Tel. 01-458 2239.

AUTHORITATIVE TECHNICAL TRANSLATIONS. Spanish, French, Italian, German, Portuguese, camera copy or printed. E. W. Sykes, FIL, 39 West Close, Wembley, Middlesex, HA9 9PJ. Tel. 01-904 4273.

Appointment vacant

BBC requires DEPUTY REFERENCE LIBRARIAN, REFERENCE LIBRARY, to assist at a senior level with the working and administration of the Central and four branch libraries with a staff of 60; to supervise the Central Library and the services it provides to other branches, e.g., cataloguing, inter-library loans and the acquisition of books and periodicals of the widest range. Candidates must be Chartered Librarians with wide experience of library work; experience of library administration would be valuable. Salary £2030 (may be higher if qualifications exceptional) × £104 to £2550 maximum per annum. Salaries to be increased in July 1970. Write for application form (enclosing addressed foolscap envelope and quoting reference 70.G.236 A.L.B.) to Appointments Department, BBC, London W1A 1AA by July 1st.

GEC-Marconi Electronics

ASSISTANT LIBRARIAN (MALE)

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- **Responsibility for Library Loans**
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- **Acquisitioning of Stock**
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The successful applicant should be aged between 25 years and 35 years and have passed Part II of the Library Association Examinations.

Some experience in the use of a Computer Generated Cataloguing and Retrieval System will be advantageous.

ELLIOTT FLIGHT AUTOMATION

Interested applicants should apply in person or write to:
Mr E. J. Warren, Personnel Officer,
ELLIOTT FLIGHT AUTOMATION LIMITED,
Airport Works, Rochester, Kent.

A GEC-Marconi Electronics Company

BOROUGH POLYTECHNIC

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Applications are invited for appointment as an

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Applicants should be chartered librarians, preferably with experience in college or industrial libraries.

It is expected to appoint at G.L.C. Grade 2, but promising applicants of more limited experience could be considered for a Grade 3 appointment.

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Grade 2 £1940–£2195 (including London Allowance)
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ASSISTANT LIBRARIAN/ INFORMATION OFFICER

We require a Chartered Librarian or Graduate for this post in the Group Library and Information Section at United Glass Limited, St. Albans.

There will be particular responsibility for daily library routines, including enquiries, interlibrary loans and indexing. This is a developing service and work with patents and commercial intelligence will also be involved.

Some experience of technical library and information work would be useful but adaptability and willingness to accept responsibility are equally important.

Salary will be commensurate with age, qualifications and experience.
Applications to:

Group Research Manager,
United Glass Limited,
Research & Development Centre, Porters Wood, St. Albans, Herts.

UNITED GLASS

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Das Aufgabengebiet umfaßt die Übersetzung von wissenschaftlichen und technischen Texten in druckreifes Englisch einschließlich des Korrekturlesens von Prospekten. Eine abgeschlossene Übersetzerausbildung oder ein Chemie-Studium und solide, im Ausland erworbene Sprachkenntnisse sind ebenso Voraussetzung für die Bewältigung der anspruchsvollen Aufgabe wie mehrjährige praktische Tätigkeit in der chemischen Industrie. Herren mit Englisch als Muttersprache, die auch die deutsche Sprache beherrschen, werden wir gegebenenfalls den Vorzug geben. Wir bieten günstige Bezüge, deren leistungsgerechte Weiterentwicklung wir gewährleisten sowie bewährte – auch heute in der Industrie noch nicht alltägliche - Sozialleistungen und Hilfe bei der Wohnraumbeschaffung. Bitte bewerben Sie sich zunächst schriftlich mit den üblichen Unterlagen (Lebenslauf, Zeugnisabschriften und Lichtbild). Nennen Sie dabei bitte auch Ihre Gehaltsvorstellung. Selbstverständlich werden wir Ihre Bewerbungsunterlagen vertraulich behandeln. Sie hören umgehend von uns.

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61 Darmstadt 2, Postfach 4119 GERMANY

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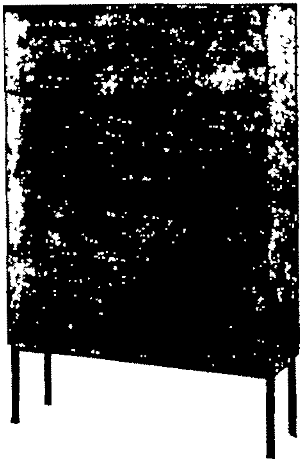

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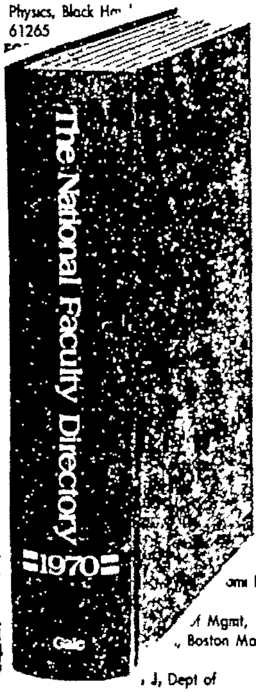

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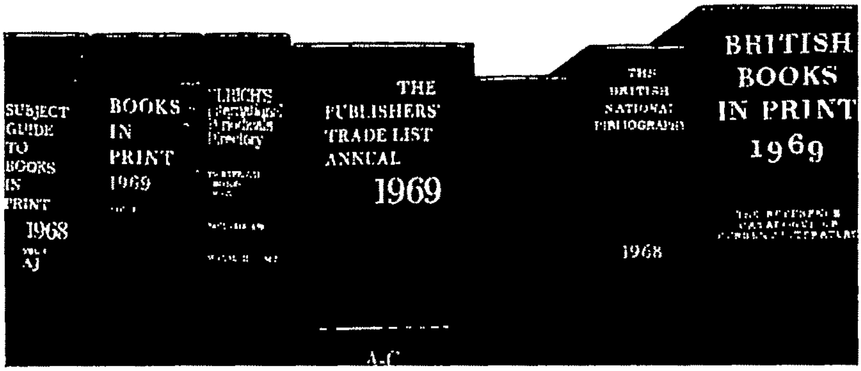
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ASLIB CALENDAR 1970

September

TUE. 8.	Aslib Chemical Group/Technical Translation Group Joint Evening Meeting. 'Technical translations: meeting the need', by Paul H. Scott (BP Research). Aslib. 5 for 5.30 p.m.
MON. 21–WED. 23.	Aslib 44th Annual Conference, University of Aberdeen.

October

THU. 1.	Aslib Economics Group Evening Meeting and Lecture. Aslib. 5 for 5.30 p.m.
TUE. 20.	Aslib Computer Applications Group Circulation Working Party. One-day symposium: 'Computer-aided systems'.
WED. 21.	Aslib/Institute of Information Scientists Joint Evening Meeting. 'OR man looks at IR', by W. T. Bane (IPC New Enterprises). Aslib. 5 for 5.30 p.m.
FRI. 23.	Aslib Technical Translation Group Meeting and Lecture by Miss M. T. Ward (SE Gas Board). Aslib. 3 p.m.

November

THU. 19.	Aslib Chemical Group. One-day conference. Quaglino's, London.
FRI. 20.	Aslib Technical Translation Group Meeting: Followed by: 'A linguistic approach to technical translation', by P. P. Newark (Holborn College). Annual sherry party. Aslib. 3 p.m.
WED. 25.	Evening Meeting at Aslib. Procedure for sorting and recording scientists' papers. Speakers: Professor N. Kurti, FRS, Mrs M. Gowing and Miss J. M. Pye. 5 for 5.30 p.m.

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* *Elected at the Aslib Annual General Meeting, 3rd June 1970*

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Aslib Open Days

Some 300 representatives of member organizations visited Aslib on the recent Open Days and discussed the services offered and inspected work in progress. This is a most encouraging response and will undoubtedly lead to similar functions in the future.

Membership Subscriptions

At the Annual General Meeting held on 3rd June, the Director was able to report that, to date, 86 per cent of the member organizations so far approached—already nearly 1000—had agreed to the new rates introduced at the beginning of this year. The Council is very gratified at this response and would like to thank all the members concerned for this demonstration of their confidence in Aslib and their appreciation of the range of services which Aslib provides.

International developments in scientific information services

The conference held on 10th June to discuss international developments in scientific information services, organized by Aslib in association with the Chemical Society, the Institute of Physics and the Physical Society, the Institution of Electrical Engineers, the Library Association and the National Computing Centre, proved to be a very successful exercise in co-operation.

About 180 delegates assembled in the Wellcome Lecture Theatre of the Royal Society to hear about the pattern of co-operation that already exists at international level, through the efforts of governments, information specialists and industry, and to look ahead to possibilities for extending this co-operation by means of a world system (such as UNISIST). The important question of assistance—in the form of an 'investment in knowledge'—that is owed to developing countries by the advanced nations of the world was also discussed. The conference papers and an account of the stimulating discussion session will be published in the August issue of *Aslib Proceedings*.

Data survey

A survey of the data needs of chemists, and the use to which they put data in their day-to-day work, is at present being conducted by the Survey Section of Aslib Research Department.

The background to this study is the growing interest, in the information field, in data supply and demand, and in organizing sources of data for scientists. It seems important to ensure that resulting new services hold the right kind of material, arranged in a realistic and meaningful way for easy retrieval. Chemistry was picked as a major scientific field in which to establish a method which could be used in any subsequent investigation.

The study falls into three distinct but related parts, covering different aspects of the subject.

(a) An interview survey, in which 500 chemists are participating. The aim is to find out how chemists define data; the sort of data they need; how often they need it; how they look for it; sources used and opinions of such sources. The individual interview lasts 30–45 minutes, depending on the volubility of the chemist concerned. A structured questionnaire, incorporating both closed and open-ended questions, is being used. Following the interview each chemist is asked to fill in brief 'data record sheets' if he seeks data during the 'next working day'. Progress on the survey is encouraging. Interviewing is half-completed. Chemists and interviewers seem to have enjoyed the exercise and the quality of material obtained by interview is good.

(b) An attempt is being made to recruit Information Departments and Libraries in the chemical field. The aim is to analyse and tabulate enquiries put to such libraries. Progress is discouraging. To date only two libraries have come forward. We need libraries recording inquiries, success rate and sources used to answer. Perhaps few libraries in fact keep such records?

(c) Finally, the published compilations themselves will be examined in the light of comments made by chemists. The aim is to see how published sources measure up to expressed demand.

Aslib/CIRIA joint conference proceedings

The proceedings of the joint Aslib Engineering Group and Construction Industry Research and Information Association conference on the subject of 'It pays to be informed', held in Leamington Spa from 28th to 30th October 1969 (see *Aslib Proceedings,* December 1969, p. 478), have recently been published by CIRIA. The conference was arranged as a missionary exercise for the construction industry, an industry in which there are rather special problems in the use and dissemination of information.

All eight papers presented, together with the discussion on each, are published here. Also included are the reports of the three syndicates set up to discuss the groups of papers at length and to report their findings to the conference.

The publication is available at 29*s* to CIRIA members (39*s* to others) and is available from CIRIA, 6, Storey's Gate, London SW1.

Aslib collection of classification schemes and thesauruses

For a number of years Aslib has been building up a wide collection of indexing languages including classification schemes, thesauruses and subject heading lists. At present the library holds approximately fifty classification schemes and some ninety thesauruses and subject heading lists covering a wide range of subjects including medicine, law, engineering, chemistry and music with the major coverage in the science and technology field. Non-documentary classifications and codes are also included. Some of the publications are for very specialized fields and all are accessible by subject through the Aslib catalogue. New publications are constantly being added and are available for reference in the Aslib library.

Chemical Group/Technical Translation Group

Mr Paul H. Scott of BP Research will speak on the subject of 'Technical translations; meeting the need' at a joint evening meeting of the Chemical Group and the Technical Translation Group to be held at Aslib on 8th September.

Mr Scott will give a description, based on his own personal experience, of the various ways in which requests for technical translations can be satisfied. The pros and cons of cover-to-cover translations, machine translation, and language training for scientists will be considered. Finally, some of the wider issues implicit in the concept of the 'Foreign-Language Barrier' will be discussed.

The meeting will begin at 5.30 p.m. (tea 5 p.m.).

Computer Applications Group

The Circulation Working Party of the Aslib Computer Applications Group is organizing a symposium on computer-aided circulations systems to be held at Aslib on 20th October 1970. Speakers from public, special and university libraries will describe the systems with which they are associated, all of which are operational or are shortly to be implemented. The emphasis at the symposium will be on the practical aspects of using computers to control loans of books and other materials from different kinds of libraries; and on the design, implementation, difficulties, advantages, costs, lessons gained from experience, etc., of particular systems.

Attendance will necessarily be limited to fifty, and those attending should preferably be librarians positively interested in, or on the threshold of installing, such systems. Early application is recommended.

The Queen's Birthday Honours List

Members will be pleased to learn that the following people associated with Aslib have been honoured in the Birthday Honours List:

Dr D. C. Martin, Executive Secretary of the Royal Society: Knighthood.
A. H. Chaplin, Principal Keeper of Printed Books, British Museum: C.B.
A. J. Wells, Managing Editor, British National Bibliography: O.B.E.

Linguistics in Documentation

A new abstracts journal called *Linguistics in Documentation* has just been published in the USA by the Committee on Linguistics in Documentation of the Fédération Internationale de Documentation (FID/LD). The first issue contains 23 abstracts mainly from American research institution publications with two from the United Kingdom and one from Greece. Descriptors are given for each item and the availability of the papers noted.

The British representative on the FID/LD Committee is Mrs Karen Needham of the Cambridge Language Research Unit.

The Library Association Robinson Medal, 1970

Entries are invited for the award of the Robinson Medal, 1970. The Medal is awarded every two years to reward the originality and inventive ability of librarians and other interested persons or firms in connection with devising new and improved methods in library technology and any aspect of library administration.

Full particulars, and forms of application, may be obtained from the Secretary, The Library Association, 7 Ridgmount Street, London WC1E 7AE. The closing date for receipt of entries is 30th November 1970.

ERIC (Educational Resources Information Center)

The American Society for Information Science (ASIS) has commenced operation of the ERIC Clearinghouse on Library and Information Sciences (CLIS). ERIC is an American nationwide information system designed to serve the field of education through the dissemination of information about educational resources and research materials. This network consists of a central staff at the US Office of Education and a number of decentralized clearinghouses, each serving a special subject area in education.

As one of the ERIC clearinghouses, ERIC/CLIS is responsible for the acquisition and processing of research reports and other documents on the operation of libraries and information centres, the technology used to improve their operations, and the education and training of librarians and information specialists. Further details about ERIC/CLIS can be obtained from ASIS headquarters at 1140 Connecticut Ave NW, Suite 804, Washington DC, 20036.

The CCM Information Corporation, a subsidiary of Crowell Collier Macmillan, also announced recently the publication in June 1970 of *The ERIC Educational Documents Index*, which brings together, for the first time, references to all research documents in the ERIC collection. The documents covered include: *Research in Education, 1966–9; Office of Education Research Reports, 1956–65;* and the *ERIC Catalog of Selected Documents on the Disadvantaged.*

The *Index* will be published in two volumes at $34.50 the set. Further details from CCM Information Corporation, 909 Third Avenue, New York, NY 10022.

Geoscience Documentation

The April 1970 issue of *Geoscience Documentation* (volume 2, no. 2) contains an eight-page account of the 'Colloquium on the Structure of Geological Information' which was held at Aslib on 2nd January 1970 by the British Group of the International Association for Mathematical Geology.

The six papers presented at the meeting are summarized in the article, including: 'The organization of information' by Dr H. Coblans, formerly of Aslib; 'Software for geological information' by Professor P. Fellgett of the University of Reading; and 'The present state of geological information' by Mr G. Lea of Lea Associates Ltd.

Geoscience Documentation is published every two months and is part of 'Geoservices', a computerized information service for the geosciences. The annual subscription to the journal is £10 10*s* which should be sent to Lea Associates Ltd, PO Box 1024, Westminster, London SW1.

Computer Output on Microfilm (COM)

The Microfilm Association of Great Britain is organizing a one-day conference on 'Computer Output on Microfilm', to be held in the William Beveridge Hall, University of London, on 22nd September 1970.

Speakers will be: Mr H. J. Taylor, Senior Systems Analyst, Datagraphix Ltd, who will describe Micromation Printers and the range of their auxiliary equipment; Mr J. Firisen, computer graphics executive with the 3M Company, who will speak on the Series F Electron Beam Recorder and sound film; Mr A. E. Kingett and Mr E. P. Denham of Kodak Ltd, who will show an animated film and give a talk on principles and usage of COM systems, including retrieval code programming; and finally, Mr S. A. Shepherd of Computer Instrumentation Ltd, who will describe the COM unit, camera options and input tape options. The conference will close with a general discussion on all the papers presented.

Booking forms are obtainable from the Executive Secretary, Microfilm Association of Great Britain, 109 Kingsway, London WC2B 6PU.

Government responsibilities in information for industry

About one hundred delegates from nineteen countries attended the Seminar on 'Government responsibilities in information for industry' held in Jouy-en-Josas, France, from 2–5th March, and organized by OECD.

Four sessions of the Seminar were held on the following themes: Industry and government (what does government expect from industry; what does industry expect from government); Government initiatives; Non-government initiatives (professional societies, private sector services, industrial initiatives); and How industries react to information. Sessions were concluded with group discussions on such topics as: Government measures to promote innovation; The management of information flow within the firm; Education and training for information use; The communication of research results to industry; and Special problems of the smaller firm. An evaluated and condensed report of the Seminar will be published by OECD shortly.

Periodical News

The National Reference Library of Science and Invention has begun publication of *Periodical News,* a monthly news sheet which lists changes to scientific and technical periodicals noted by the Library during the preceding weeks, together with a select list of new titles recently added to the Library's stock. Such changes to periodicals include changes of title, amalgamation of journals, divisions into several series, closures, etc. Further details of any title listed can be supplied by the NRLSI on request.

The news sheet is free of charge and can be obtained from The Editor, Periodical News, NRLSI, 25 Southampton Buildings, London WC2 1AW.

US Government Research and Development Reports (USGRDR)

The Clearinghouse for Federal Scientific and Technical Information has made available on magnetic tape its *USGRDR* announcement journal beginning with the 10th January 1970 issue. A magnetic tape containing information equivalent to each *USGRDR* will be issued on the journal publication date, 10th and 25th of each month.

The tapes will be released on 600-foot 'mini-reels' and the subscriber may select either (1) 7-track tape, 556 or 800 characters per inch (cpi), and odd parity, or (2) 9-track tape, 800 cpi, and odd parity. The data on the tapes will list 40,000–50,000 new research reports each year.

Annual subscription for the 24 issues is $1,500 and prepayment is required. Orders should be sent to Clearinghouse (152.12), US Department of Commerce, Springfield, Virginia 22151.

DRUGDOC

The Computer Services Division of the Wellcome Foundation Ltd, at Dartford, Kent, recently received the first of a series of weekly magnetic tapes containing information on specific biomedical, pharmacological, experimental and marketed drugs and chemical compounds. Known as DRUGDOC, this is a computer-based biomedical information service provided by the Excerpta Medica Foundation from their Netherlands office, and is designed to meet the requirements of pharmaceutical companies throughout the world.

Further information about DRUGDOC can be obtained from Excerpta Medica, Chandos House, 2 Queen Anne Street, London W1M 9LE.

Modern British political records

The Social Science Research Council has awarded a grant of £40,722 to Mr D. A. Clarke, Librarian of the British Library of Political and Economic Science at the London School of Economics, for a five-year project commencing in October 1970 to locate and list British political manuscripts of the twentieth century.

Investigations will cover the papers of persons and institutions active in politics between 1900 and 1951. Subjects of the enquiry will include members of parliament, heads of diplomatic missions, chiefs of staff, senior civil servants, trade union officials, religious leaders, publicists, academics, business men, political parties, societies, institutions, pressure groups, etc. It is estimated that some five thousand individuals and institutions will fall within the scope of the survey.

A Political Archives Investigation Committee was set up in 1967 on the initiative of Nuffield College Oxford, to investigate the possibility of such a project. A two-year pilot scheme, also financed by the Social Science Research Council, has already been undertaken at Nuffield College by Mr Cameron Hazlehurst with the object of locating the papers of cabinet ministers between 1901 and 1951.

The definitive project is being carried out at BLPES where a Senior Research Officer is to be appointed as principal investigator, with any necessary day-to-day guidance being given by Mr Clarke. Subject to the agreement of owners of documents, the results will be published in the form of lists and a guide.

Technical Journals for Industry

Two further national lists in this series have been published as part of the

FID 415 project. These are for Czechoslovakia and Germany and they are obtainable from the issuing organizations:

Czechoslovakia: Central Office of Scientific, Technical and
Economic Information,
Prague.
Germany: Institut für Dokumentationswesen,
Frankfurt/Main.

Engineering Index on microfilm

Engineering Index, Inc. is making available on microfilm the abstracts, of which there are more than 1,600,000, on all aspects of engineering which it has published since its inception in 1884. The *Ei* Microfilm Edition is available in both 16mm and 35mm positive and negative microfilm and meets the specifications of all standard readers and reader-printers.

An evaluation reel, and details of the lease arrangements through which the Edition is being made available, can be obtained from: John E. Creps, Jr, Manager, Marketing and Business Services Division, Engineering Index, Inc., 345 East 47th Street, New York, NY 10017.

People and Places

MR BRIAN J. WILSON has been promoted to Assistant Secretary in the Central Electricity Generating Board. Mr Wilson, who is editor of the *Aslib Directory,* was formerly Head of Information Services at CEGB.

MR SPENCER HUDSON, formerly Head of the Technical Information Division of the British Standards Institution, was recently appointed Manager of Recreational Services for the London Borough of Greenwich. Mr Hudson will be well known to Aslib members as the BSI's former representative on Aslib's International Relations Committee and as a speaker at Group meetings and conferences. His role in this new integrated post includes the administration and promotion of the Council's library services, swimming pools and baths, parks and sport facilities, community centres, playgroups and arts and entertainment activities.

MR B. T. STERN, a member of the Council of Aslib, is now Head of Research Information (Group) at the Wellcome Foundation Ltd with responsibility for the co-ordination of information services throughout the Group on a worldwide basis.

MISS HELEN TOWNLEY has been promoted to Head of Information Services at the Wellcome Research Laboratories in Beckenham.

MR T. M. AITCHISON, Information Research Manager of INSPEC, Institution of Electrical Engineers, and a member of the Council of Aslib, was recently elected Honorary Research Associate of the School of Library, Archive and Information Studies at University College, London.

Mrs Elizabeth Mack

Mrs Elizabeth Mack, Head of Aslib's Library and Information Services, left the staff at the beginning of July to take up her appointment as Head of Information Services at the Central Electricity Generating Board. Mrs Mack first joined

Aslib in January 1951 as Information Officer. She left in 1958 to join Metal Industries Ltd but returned in 1961, and in 1968 she was appointed Head of Library and Information Services.

Her colleagues at Aslib wish her every success in her new appointment.

BRIEF REVIEWS

BOARD OF TRADE. Competition, monopoly and restrictive practices: a select bibliography. London, HMSO, 1970. 127 p. 38*s* (SBN 11 510211 6).

This work was compiled by the Economic Research Unit of the Board of Trade in collaboration with the Board of Trade Library. It lists 1,200 publications, generally applicable to conditions in Great Britain, which appeared between 1950 and 1967. The references are listed in seven main classes and twenty-one sub-classes and selectively annotated. There is a name index and a comprehensive subject index, and there are three useful appendices listing journals cited in the bibliography, Monopolies Commission reports and restrictive trading agreements considered by the Restrictive Practices Court. The volume fills a bibliographical gap in this field, and should prove most useful to research workers, academic institutions and commercial and industrial organizations.

HERNER, SAUL. A brief guide to sources of scientific and technical information. Washington, DC, Information Resources Press, 1970. 102 p. $4.25.

This guide is a revised, updated and expanded version of *A guide to information tools, methods, and resources in science and technology.*

Short descriptions are given of periodicals, abstracts and organizations likely to be of use to engineers or scientists in tracing information on recent and past research and development in various fields. Some sample pages from the sources are reproduced. Also included are short chapters on the organization of personal index files and the relationship of the scientist or engineer to his information tools. There is an index of subjects, names of organizations and titles of publications.

This publication is based on a short course that was attended by federal scientists and engineers in the United States; consequently there is a strong American bias to the sources included. Although most of the information is probably already known to information officers and librarians, the publication should prove helpful to scientists and engineers.

MORTON, LESLIE T. A medical bibliography (Garrison and Morton): an annotated check-list of texts illustrating the history of medicine. 3rd edition. London, André Deutsch, 1970. 872 p. £12 12*s* (ISBN 0 233 96130 5).

This is the third edition of the book first published in 1943, revised not only to bring existing sections up to date, but also to take account of new discoveries and advances in the field of the history of medicine. The total number of entries is greater than in the previous edition: some 700 items have been added and some 100 removed, bringing the total to approximately 7,500. The layout is the same as that of the previous editions, with the references listed chronologically within their subject classification, with full bibliographical details and annotations indicating the scope and contribution of the individual works; there are also full name and subject indexes.

ODQVIST, DAGMAR. Teknisk dokumentation omkring år 1850. Stockholm, Royal Institute of Technology Library, 1970. 22 p. (Occasional paper 8).

This is a short record, by a former librarian of the Royal Institute of Technology Library, Stockholm, of the work on the documentation of technical periodicals carried out by the Institute's Library during the middle part of the nineteenth century.

One of the first activities of the Institute, after its foundation in 1825, was the development of its own library. The monograph outlines this development and pays particular attention to the work on the documentation of periodicals undertaken by A. H. E. Fock, librarian of the Institute from 1848 and compiler of the library's first subject catalogue, and by his successor E. Fogelmarck, librarian from 1858.

In the second half of the work, the author has recorded and commented on some of the items displayed at a temporary exhibition of select periodicals, held in 1969, to commemorate the registration in the library of periodical number 10,000.

THE PENROSE ANNUAL 1970. vol. 63. Edited by Herbert Spencer. London, Lund Humphries, 1970. 90*s* cloth (ISBN 0 85331 2532); 65*s* paper (ISBN 0 85531 0).

This now classic review of the printing industry and the graphic arts, which started 75 years ago, is keeping up with the times by introducing two innovations in the current volume. It is now being issued in alternative bindings and in a more compact form—236 pages as compared with an average of 300 pages in recent years. None the less it carries 7 per cent more text and 20 per cent more illustrations than last year. Of the 23 articles 5 are of special interest for workers in documentation.

Weaver, J. A. (Mullard Research Labs.): The future of optical character recognition. ('There will be an increase in the number of cheap remote "reading terminals" connected over telephone wires to the computer.' 'Large scale integration of circuits will make possible a new kind of machine . . . (to) process the image of characters.')

Turnbull, A. R. (Edinburgh University Press): Short-run publishing.

Wakefield, R. J. (Univ. of London Inst. of Computer Science): A computer is not a piece of paper.
('. . . two fields must . . . be examined: the work done in computer science on formal language design, and the nature of the existing usage of language in paper records.')

Whitaker, D. (Director, SBN Agency): International Standard Book Numbering Agency.

Wallis, L. W. (Crosfield Electronics): The phototypesetting jungle. ('A close-up analysis of the various systems from the point of view of suitability for particular work, efficiency, and capital costs is attempted.')

ROUND, G. F. *comp.* Solid–liquid flow abstracts. Vol. 1, A–J; vol. 2, K–Z; vol. 3, indexes and supplements. New York, London, Paris, Gordon & Breach, 1969. 1046 p. Vol. 1, £18 10*s* (SBN 677 40080 2); vol. 2, £19 7*s* 6*d* (SBN 677 40090 X); vol. 3, £11 5*s* (SBN 677 40100 0). £45 *the set.*

The intention of this publication is to include abstracts of all theoretical and experimental work, available in published form or as a university thesis, in the field of solid–liquid flow. The emphasis is on flow in pipes, tubes and capillaries. Patents and research reports are included but internal company reports are not. About 800 journals covering the years 1948 to 1966 have been abstracted and other abstract sources and bibliographies have been used. In the latter instance, a particular paper or report has been located and a new abstract written.

The work is in three volumes. Vols 1 and 2 contain numbered abstracts arranged alphabetically by author, and vol. 3 contains a supplement to vols 1 and 2, the author and subject index, and a list of journals abstracted. This publication is now supplemented by the quarterly journal *Solid–Liquid Flow Abstracts* which covers the literature from 1966 onward.

SCIENZA & TECNICA 70. Annuario della Enciclopedia della scienza e della tecnica. Milano, Arnoldo Mondadori, 1970. 566 p. Lire 14,000.

This is the third annual review of the progress of science and technology supplementing the well-known Italian encyclopaedia. It includes such broad subject groups as: The exploration of extra-territorial space, Life and the environment, Changes in the biosphere, Problems of mathematics, Logic and the philosophy of science. Of special interest for readers of this periodical is the large last section on Documentation, with a foreword by the Director-General of Unesco, the international organization which has a special responsibility for documentation. This section consists of two parts: The nature and development of documentation and scientific information (historical background and the state of the traditional art) and Documentation techniques in the field of scientific and technical information (new trends especially in mechanized approaches). There is a supplementary part giving a detailed description of the programme and activities of 28 organizations (mostly world wide in scope) active in scientific and technical information.

WESTMINSTER CITY LIBRARIES. Union list of periodicals. London, Westminster City Libraries, 1970. 129 p. 20*s* (SBN 900802 01 4).

The guide is in two parts: an alphabetical list of the periodicals, and a subject index to titles. Coverage now includes all periodicals held in the libraries of the new City of Westminster; it is not limited to those currently taken, as in the first edition published in 1949.

In the alphabetical sequence, entry is made under the current or last title with references from any earlier titles within the period of the libraries' files. Details are given, under the main entry in the title sequence, of each library's holding in order of length of file and then alphabetically by each library's identifying symbol.

This is a valuable guide to the journal holdings in the Westminster City Libraries especially in the fields of music and the fine arts and medicine, which are the major subjects allocated to these libraries in the Inner London Subject Collection scheme.

PLANS FOR A NEW SYSTEM OF BUSINESS STATISTICS

M. C. FESSEY

Business Statistics Office, Board of Trade

Paper presented at an Aslib evening meeting, Wednesday, 25th March 1970

IT IS flattering that a statistician should be asked to address a gathering of librarians. In *Five Orange Pips* Sherlock Holmes remarks that a man should keep his little brain attic stocked with all the furniture he is likely to use and the rest he can put away in the lumber room of his library where he can get it if he wants it. I have no view about Conan Doyle's definition of a library as a lumber room, but certainly I find the little brain attics of librarians well stocked with one of the two branches of epistemology, as Dr Johnson defined them: 'Knowledge is of two kinds. We know a subject ourselves or we know where we can find information about it'. I pay tribute to the ability of librarians to find information about statistics, despite what must occasionally seem to them the perverse ingenuity with which statisticians make the task difficult. It is easy enough to find United Kingdom statistics. There are an infinity of them—in the Digests of Statistics,[1] of Financial Statistics,[2] of Regional Statistics,[3] and so on. The trouble is that those who inquire of you usually want a particular statistic—although the phrase 'any figures will do' is one which is not unfamiliar to me. To find in the forest of United Kingdom figures the particular sapling which a researcher is seeking is sometimes far from easy. My experience is that the librarians know their way about the lumber at least as well as we statisticians do.

The main topic of my talk will be how the new scheme of industrial statistics is developing. It has been briefly described in articles in *Statistical News* and elsewhere. I propose, too, to say something of the difficulties we expect to meet which will interest you as librarians. I shall leave you to tell me of the difficulties we have not foreseen and the shortcomings of the plans I shall describe.

But perhaps I had better first say something very briefly about the statistics we have at present and about the shortcomings which are attributed to them. It is to overcome these shortcomings that the new system has been designed.

Business statistics—and I am only talking about business statistics—must, to a gathering of librarians, of all people, first be defined. I am talking about the statistics relating to the business community. They are the statistics of factories and shops, of garages and warehouses, of hotels and laundries. They cover sales and purchases, employment and wages, capital investment and stocks, and so on. They can be divided into two broad classes. Long-term inquiries are generally designed to throw light on the structure of the business economy. Short-term statistics are designed to show how business is currently moving.

The need for information about the structure of industry was recognized in the early years of this century when questions of tariff policy were attracting the attention of the country and Parliament, and prompted the Government of the day to take a first Census of Production in 1907.[5] Sixty years later the 1968 Census of Production,[6] whose provisional results were published on the last day of last year, is planned to be the last in this series of roughly quinquennial inquiries.

Essays into the structure of other kinds of business—generally the distributive trades—have a much shorter history. A group of businessmen organized a pilot inquiry into statistics of shops before the war,[7] but it was not until 1950 that the first official Census of Distribution and Other Services was held in the United Kingdom.[8] Since then there have been three others—in 1957, 1961 and 1966—and we are now planning a census of retailing and some service trades for 1971.

The two censuses then, of production and distribution, provide a wealth of information collected at long intervals about the structure of the business economy. Short-term statistics, as we know them today, developed out of the needs of the last war, but they have increased tremendously in scope. The first national income accounts appeared during the war years but these gave only annual figures. It was not until the late 1950s that short-term statistics had developed sufficiently to provide the basis for quarterly accounts.

So much then for a bird's-eye view of statistics as they are today. For twenty years or so, this system of statistics as it developed over the post-war period, was subject to remarkably little criticism except perhaps on the question of the timeliness of statistics when Mr McMillan in his 1956 Budget speech referred to trying to run the economy on last year's Bradshaw. Since 1964, on the other hand, criticism of official statistics has been remarkable in its volume and its comprehensiveness. The criticisms are epitomized in the Fourth Report of the Estimates Committee, Session 1966–67,[9] in a whole day's discussion organized by the Royal Statistical Society,[10] and in comments on official statistics, for instance by the Market Research Society and Industrial Marketing Research Association.[11]

These criticisms reflect many viewpoints. But underlying them all is the fact that a system of statistics, which was more rather than less adequate for the macro-economic approach of the 1950s to economic control and for the modest statistical requirements of such economic departments as then existed in business firms, is quite inadequate for micro-economic control and for the burgeoning market research activities of industry today.

What are the specific criticisms of the statistical system which the Business Statistics Office is commissioned to overcome? There are, I think, four—lack of timeliness, lack of reliability, lack of comprehensiveness and lack of co-ordination.

The statistics are less timely than they should be. It is a criticism which began, justly enough, with our disastrous 1963 Census of Production,[12] but in a more normal context timeliness must compromise with other desirable attributes of statistics. Early publication means more estimation and more revision—and revision and lack of reliability seem synonymous in the minds of commentators.

Lack of comprehensiveness we hear most frequently about in relation to statistics of commodities, even though there is a wealth of information about production of many individual commodities, in the Business Monitor series.[13] But these are patchy, in the sense that very detailed information is available about commodities produced by some industries while for others the information is of the sketchiest. Outside the field of production, criticism about lack of comprehensiveness is in more general terms. There has been no census of wholesaling since 1950, for example.

The last of our four sins is the lack of co-ordination and congruence. This limitation arises because, over the years, individual statistical series have often been set up to meet a specific need. The result is that it is usually not possible to compare one set of figures with another set and get answers which are within the degree of reliability which policy makers and commentators, in Government, in business, in the universities and elsewhere, demand. To take an example, one of the most popular statistics with the commentators is output per head. They often confuse it with productivity. How does output per head move, how does it compare between industries, how are we faring in the international league tables, and so on? The only statistics of net output per head on a consistent basis are those which can be derived by comparing the figures of output with those of employment given in the quinquennial Census of Production reports. To measure trends in output per head you must compare an indicator of output with an indicator of employment. The first is based on information collected by the Ministry of Technology and other production departments, and the second on figures collected by the Department of Employment and Productivity. The economic significance of the small movements of the two indicators in conjunction can be obscured by the lack of comparability of the components.

Finally, let me come to one drawback to holding complex inquiries like the censuses at long intervals which is very apparent to those whose business it is to hold the inquiries. Only a small proportion of the people both in the statistical agency and in respondent firms who handle one census are likely to be in the same post when the next census comes round. A great deal of expertise has been developed in the Business Statistics Office but equally a great deal of it is lost before it can be applied again.

I come then to what we are doing to improve things. In particular, I am going to describe briefly the new system of industrial statistics with which over the next few years we aim to replace the present system of quinquennial censuses and short-term inquiries. Let us look at the new system in terms of the frequency of the various inquiries within it.

Firstly, we shall need monthly figures to provide indicators of how the economy generally is moving. These will be very summary figures—for example, the value of total sales of a firm. Timeliness will be of the utmost importance and we must only ask firms to supply information which is readily available from their books.

We shall be asking for quarterly figures of the value and, where appropriate, the quantity of sales of individual commodities. The demand for this information comes not from Government but from industry: the marketing side of firms, those concerned with production planning, and market research agencies have made clear to us the importance they attach to this particular improvement in official statistics.

We shall be asking firms to supply some aggregated annual figures which we hope will be reasonably easily available from their accounts: total sales, total purchases, employment, wages and salaries, stocks, capital expenditure. These figures can, I suppose, be described as the stock-in-trade of all economists interested in industry, whether they are in government or in business. They will provide a guide to the changing structure of industry, as well as bench marks for short term indicators like the index of production.

There will be less frequent inquiries in other fields—transport expenses, details of purchases, etc.—which we shall have to pursue from time to time.

The Central Register of Businesses is the link between this new system of statistics and our search to overcome the four criticisms of the present system which I have mentioned—their lack of timeliness, accuracy, comprehensiveness and co-ordination.

A prime reason for lack of co-ordination between different statistical series is that the Government Departments conducting the different inquiries each build up their own registers for the inquiries. The address within a firm which supplies, for example, figures of capital investment may well be different from the address which supplies figures about output or employment. To some extent this is inevitable because the nature of the information is different. The accounts department of a firm will be responsible for capital investment figures and the personnel department for employment figures.

First, then, we are aiming to replace all the different business registers used by Government Departments to conduct statistical inquiries by a Central Register held at the Business Statistics Office. But this will not be simply a mailing list or a sampling frame for different inquiries. It is through the Central Register that we hope to be able to co-ordinate the results of different inquiries. How this can be done presents an extremely complex problem. One possibility is that each reporting unit will be linked to the registered company of which it forms a part. Hence it should be possible, for each statistical inquiry we conduct, to provide statistics for the companies operating in the field covered by the inquiry, even though the scope of each reporting unit (and the number of reporting units within a company) differs widely.

It is on this basis of standardization, possibly at company level, that we hope to maintain comparability of different statistical series in future. But first it will be necessary to establish, company by company, that for each statistical inquiry the returns we receive cover the whole of the activities of the company and that there is no duplication between one reporting unit and another within the company.

This will require an ambitious inquiry but until it has been conducted the co-ordination between different statistical series will be an article of faith rather than a matter of fact. It is likely to be well into the 1970s before we get this inquiry under way.

Let me turn to some of the limitations of the new system which must be accepted, even when it is running. First, although I have spoken of comparability of statistics at company level let me make it clear that this is an operational requirement in the Business Statistics Office, and I am not saying that we shall be able to provide, company by company, the statistics we collect. Our powers to collect statistics from business derive from the Statistics of Trade Act, 1947,[14] which forbids us to disclose information relating to an individual undertaking without the written consent of the person carrying on the undertaking. The new system of statistics in no way departs from this accepted rule, which is the basis of good relations between a statistical service and the business community on which the collection of timely and reliable figures rests—not only in the United Kingdom but in all countries.

But aside from this question of confidentiality of information relating to an individual business, the company approach to a Central Register of Businesses which I have described would itself have implications for the comparability of statistics. First, many companies operate in different standard regions of the United Kingdom. It follows that the aggregates which we should be able to provide through the mechanism of the Central Register would be comparable, but comparable only at the national level. We should not be able to provide comparable series at regional level of, say, employment, from inquiries conducted by the DEP, and of orders or capital expenditure obtained through separate inquiries by the Ministry of Technology. Secondly, the activities of companies are often fairly diverse. In the quinquennial censuses of production, for example, we have traditionally collected figures from individual establishments—which for the purpose of this talk we can equate roughly with individual factories. A factory can be allocated to a minimum list heading of the Standard Industrial Classification,[15] generally with a fair amount of confidence, although in some cases a factory will be producing a rather large range of products and its allocation to a particular minimum list heading of the Standard Industrial Classification is inevitably arbitrary.

This element of arbitrariness will of course be much accentuated in series of statistics which achieve their comparability by the use of the company as the standard unit. Technically, the effect of this arbitrariness of classification will be seen in a lower index of specialization within minimum list headings of the SIC. By index of specialization I mean the proportion of output of a reporting unit which is accounted for by principal products of the industry to which the unit is classified.

Let me summarize then. The Central Register of Businesses will in due course provide us with a tool for combining different sets of statistics on a much more comparable basis than has been possible hitherto. But this comparability will not extend beyond the national level for these statistics, and the basis of industrial classification for them will be rather rough and ready in some cases. But do not let me lose you in this technical forest into which I have led you. I am not saying that it will no longer be possible to provide the regional statistics which exist today nor that in general the industrial classification of different statistical series will be less refined than it is now. For a particular statistical inquiry we shall still collect figures from the appropriate reporting units—from factories in many cases. For particular series in isolation we shall be able to provide in future the breakdowns and the analyses we provide at present. It is only when we are called upon to provide comparable figures from independent statistical inquiries that the limitations of the regional breakdowns and statistical classifications will obtain.

So far I have been talking in the main about statistics of manufacturing industry because thinking towards the new system is more advanced there than it is for statistics of retailing, wholesaling, and the service trades. In the manufacturing field the Business Statistics Office has maintained and kept up to date for the last twenty years or so a register of manufacturing establishments for our statistical inquiries. Indeed, in this field we are already getting towards having a Central Register. We have been matching our register with a register of employers maintained in the local offices of the Department of Employment and Productivity. By the end of this year we hope to have a register of manufacturing units which will be available to any Government Department which wishes to conduct a statistical inquiry.

In the distribution field on the other hand—retailing, wholesaling, catering, garages, and so on—we have never sought to maintain an up-to-date and comprehensive register. We have in general built up registers for each inquiry we conduct. The best-known example is the register for the Census of Distribution. For the first census for 1950 and for the sample censuses in 1957 and 1966 we ourselves sent enumerators into the field to list all the shops they could identify. In 1961—and we shall do this again for the full census we are planning for 1971—shops were listed for us by the census of population enumerators.

We have not maintained up-dated registers outside the manufacturing field because of the difficulty of the task. There are half a million shops in Great Britain and they change hands very frequently. So far we have not hit on a way of compiling a register of shops except by a field enumeration nor have we devised an economical way of up-dating a register of shops when we have compiled one. The problem is not always one of sheer size. In the case of the wholesaling trades, for example, undertakings are very difficult to enumerate even in the field survey. A shop is more or less recognizable as such but a wholesaler's premises may be indicated by no more than a brass name-plate on the door of a building housing a number of other businesses. Our experience of building registers from trade directories, lists of members of trade associations, and so on—and we do this regularly for inquiries into such trades as garages and catering—is that this sort of approach is far from adequate for a comprehensive census.

If then the Central Register is to be the comprehensive register of businesses we want it to be, we must devise new methods for ourselves. This was one of the two ends that a Section in last year's Finance Act[16] should help to achieve. Section 58 of the Act empowers the Board of Inland Revenue to disclose to the Department of Employment and Productivity and to the Business Statistics Office the names and addresses of employers operating the PAYE scheme for income tax purposes. This development will, first, enable the Department of Employment and Productivity to conduct an employment census in 1972. This is necessary because the exchange of insurance cards on which the present count of the labour force depends will cease. Secondly, the Business Statistics Office will be able to use the list of 'pay-points', as we call them, as a point of entry for building a register of nearly all business establishments. Not quite all, because there are quite a large number of one-man businesses without employees in the United Kingdom—many of them retailers. But in terms of the amount of business, the 'pay-point' approach seems likely to provide us with an opportunity of compiling a pretty comprehensive register to an extent which has not been possible hitherto.

I have explained already how we hope to use the Central Register to link together and correlate the results of different statistical inquiries. But aside from its statistical context, the register will be a valuable tool in itself. At the Business Statistics Office we are very frequently asked for lists of firms classified to particular industries. As I have said, at present we have no such comprehensive lists outside manufacturing industry. The Central Register, when we have compiled it, will go a long way to filling this gap.

But again I must remind you of the confidentiality restrictions imposed upon us. We cannot divulge any information we collect under the Statistics of Trade Act, whether it be statistical information, or the name and address, or the industrial classification of an individual firm, without the permission of the firm concerned. In the Census of Production 1968 we have asked firms specifically for their permission to show their name against the industry to which we have classified them and about four out of every five firms have agreed to this. We are considering how this information shall be made available when the detailed census reports for each industry are published in 1972.

We are seeking permission from respondents to other inquiries to publish their names and addresses and the industry in which they are engaged. We are doing this, for example, in the first of the new annual censuses which we shall be taking for 1970 and we may be able to include a question on these lines in the next census of distribution.

We are planning to include in the Central Register a range of information for each unit we identify—its name, its address, its industrial classification, geographical indicator, and one or more indicators of its size. We are discussing with representatives of industry what information might be made available about individual firms—particularly perhaps their addresses and industrial classification—without the risk of damaging their businesses. The usefulness to the public of the Central Register will depend on the extent to which we are able to solve these problems.

This has I am afraid been a complex paper. This is because a whole system of business statistics for a major industrial country is a complex thing. I have talked about the integrated system of industrial statistics which we shall be introducing over the next few years. I have said something about the difficulties which we meet in compiling statistics of the distributive and service trades. I have told you of our plans for the Central Register and what these will mean in terms of the comparability of statistics on the one hand and, on the other, of the availability of non-statistical information about individual undertakings.

Let me close then by relating these rather complex technical considerations to your own field. What are our plans for publishing whatever comes out of the new system? The four criticisms of statistics which I summarized earlier have been technical ones. There is another sort of criticism we face. The report of the Estimates Committee was, I am sure, speaking for librarians when it 'was concerned at the apparent lack of any central policy regarding publications and their contents . . . the CSO, having produced and published statistical material and given it initial publicity, regarded their task in this respect as over'.

There have been some changes for the better to note since the Committee published its report three years ago. The CSO has published an up-to-date edition of *National Income Statistics: Sources and Methods*,[17] and has appointed an Information Officer who will help the public find its way about official statistics. *Statistical News* now gives, four times a year, information about developments in the field of official statistics.

Within the next year or two there is clearly going to be a sharp increase in the volume of statistics which the Business Statistics Office produces. We are considering the technical problems of making it available of course. You will, I am sure, be glad to know that we are well aware of the need to have the advice of librarians on these matters and they are joining in our discussions. In very broad terms we shall have four sorts of information. There will be the non-statistical information on the Central Register about individual firms—and again I must mention how the difficulties of confidentiality supervene. We shall have information about their affairs provided by individual undertakings and here confidentiality requirements will rule out publication. At the other end of the scale we will have the aggregated statistics which will be published in special reports, in digests of statistics, in articles, and so on.

In between there will be—and indeed there is at the Business Statistics Office now—a vast mass of very detailed information which is available to the public and it is here that the problem of dissemination is difficult. Clearly, publication in a traditional sense of putting on paper and selling the very detailed statistics we have is not an economic exercise. If, say, we can provide information about the number of shops, and turnover, persons employed, and purchases of grocers' shops in a ward in Bradford, clearly the demand for such information is very limited—and the cost of providing it can be very high in terms of machine time and particularly of ensuring that the information passes our scrutiny for confidentiality. It is not easy to specify in great detail exactly what we have available although we are trying to develop techniques which will help in this direction. For example, we hope in the 1971 Census of Distribution to use the grid references of the Ordnance Survey to locate business premises within 100 metre grid squares. If we can do this, then it will be possible to specify to our customers how they must define a particular area for which they want statistics. We are considering too the problem of commodity coding in quite a wide context—the need to correlate the headings under which we collect figures of sales with the headings under which imports and exports are recorded, the work which the National Computing Centre is doing on a national commodity code, the possibility that before very long we shall have to pay regard to the various codes introduced by the Commission of the EEC countries—Nimexe,[18] Nice[19]—and so on.

These are highly technical matters which take us into complex questions and begin to enter the field of computer technology. For our new office at Newport—we are moving down there from Eastcote in stages over the next two or three years—we have in mind a very large ICL 1906 A computer. This would provide facilities far beyond anything we have at present. I expect someone among you will ask me to look beyond the 1970s and into the 1980s, when even bigger computers will be commonplace and when we must assume we have in working order the statistical system I have described to you today. What, it may be fair to ask, are we planning to do to make information available, for instance by giving librarians direct access to our computers? It is a prospect that faces us both with a large number of problems. I have mentioned some of the problems of devising widely accepted and understood systems of coding and classification which must be solved before we can all of us enter the era of what the computer technologists call the conversational mode. The Business Statistics Office, in, say fifteen years' time, will have accumulated such a vast bulk of information that we shall have to multiply by many times the resources at present devoted to information retrieval systems. We can look forward to the day when the computer itself can examine and approve or reject requests for information by an account holder, depending on his status in relation to access to confidential information, for example, or the standing of his credit card with us. But shall we ever be able to get the computer itself to estimate in advance the cost of a job? Otherwise some unfortunate librarian, whose Committee has agreed, shall we say, to a budget of £500 for access to the statistics in the computer, will one day 'phone and put to it what seems a simple request. Half an hour later he may find that the computer has spent his £500 and still done only half the sums.

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DISCUSSION

MR E. D. WIGGINS (Fisons) asked whether it was the intention of the BSO to devise a new classification coding for commodities within industries, notwithstanding the existence of several, some international, classification codes. MR FESSEY explained the difficulties and intricacies of the commodity classification. BSO at present used the Census of Production Classification of Commodities. The new system, now in the course of preparation, would be 'Industry' based, not 'Commodity' based.

MR M. M. CHURLISH (Ministry of Technology) asked the speaker if he would comment on the possibility of obtaining the accounting and other financial information which was then being fed into the Companies Register under the 1967 Companies Act and of making this available from the BSO. MR FESSEY said that on a number of occasions over the last ten years or so the Board of Trade had considered what part computers might play in its Company Registration Office, both from the point of view of the administration of the office and so far as figures from reports and accounts of companies lodged at Companies House were concerned. It was unlikely that accounting information from all company reports would ever be mechanized. There were something like half a million companies altogether, many of them very small. Many of them too were subsidiaries of other companies and the aggregation of figures for all companies would involve a large amount of double counting. Finally, while the Companies Act laid down information which had to be provided, there was no standard form of return and the analysis of company accounts into a standard format was an extremely skilled and expensive business. The Statistics Division of the Board of Trade, had, however, since 1954—and before that similar work had been done by the National Institute of Economic and Social Research—analysed in a standard form the accounts of some 2,000 large public quoted companies engaged in manufacturing and distribution. The results of this analysis had been published over the years in total and by industry groups, and the standardized analysis for a particular company could be examined at the branch of the Board of Trade Statistics Division located at Companies House, 55–71 City Road, EC1.

MISS M. A. SELBY (Beecham Research Laboratories) asked what the basis was going to be on which the CSO would decide whether figures for value of goods or for physical quantity of goods would be appropriate for a particular industry. MR FESSEY said that the figures which would be collected in the new system of industrial statistics were being negotiated by Production Departments (in the main the Ministry of Technology) with the industries concerned. The aim was to collect figures of the value of sales of all commodities each quarter and where it was appropriate to do so, the quantities of goods sold would also be collected.

MR M. A. FERRIE (3M Company Ltd) asked to what extent various Ministries would continue to collect statistics as at present. For example, would the figures for vehicle production still be available from the Ministry of Technology or would this function be taken over by the BSO. MR FESSEY said that when the form of a new inquiry had been agreed between the Production Department and the industry concerned, it would be the job of the Business Statistics Office to collect the figures. In discussions with industry about the new system of statistics, careful consideration was given to statistics which were collected at present, and the aim of the new system was to improve and not duplicate what was now available.

MR E. CULLEN (Texas Instruments Ltd) asked if any management controls and/or disciplinary action could be taken to ensure response by industry to quarterly surveys. MR FESSEY said that most statistical inquiries which the Business Statistics Office conducted were made under the provisions of the Statistics of Trade Act, which provided for the imposition of penalties on an undertaking which failed to complete a questionnaire. But timely and reliable statistics depended essentially on goodwill and understanding between industry and the statistical authority, and the Business Statistics Office and Statistics Divisions of Government Departments were careful to make every effort to carry trade associations and individual businesses along with them in their statistical work.

MR CULLEN asked about the comparability of overseas trade with with production statistics. MR FESSEY replied that in the review of industrial statistics which he had described, they were taking into account, when deciding headings under which production statistics were collected, the need for congruence between those headings and the headings under which imports and exports were recorded. This congruence would be achieved partly by moving the industrial headings towards the headings used in the trade statistics (which were based on the United Nations Standard International Trade Classification) and partly by adapting the fine detail of the trade statistics to the headings used in collecting production figures.

MR J. FLETCHER asked what the publication pattern would be of the new monthly, quarterly and annual statistics. MR FESSEY replied that this was something they were considering with the Central Statistical Office. At present the statistical publications tended to be functionally oriented—i.e., that there was a series of census of production reports, a series of wholesale price index numbers, a series of employment figures, and so on. Their impression was that public demand might be more for publication by industry. They might publish a quarterly series for each industry—roughly minimum list headings of the Standard Industrial Classification—which would give production figures, price indices, overseas trade figures, employment figures, and so on, for the industry. But this was one of the many problems they were still thinking about.

ON THE DESIGN OF INFORMATION SYSTEMS FOR HUMAN BEINGS

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Paper presented at a meeting of the Aslib Social Sciences Group,
Thursday, 19th March 1970

PLANNING of any kind can be motivated by a pressing practical problem which has to be solved—for example, an increasing number of people may have to be housed in the same area; or by a long-term idealistic vision; or by both (the idealist seeing the long-term implications of an immediate problem). In short-term planning, the danger exists that the more technical problems may be solved, without attention to their implications for human beings; to take my housing example, higher and higher flats may be built, without considering the possible effects (e.g. the effect on social groupings). In long-term planning, Utopian or ideological blueprints may be produced.

We have some idea of what can happen in both short- and long-term planning. In the first case, people may avoid high flats wherever possible, and where not, they may express their feelings by wrecking them (whether deliberately or by trying to make them conform to what they were used to before). In the second case, attempts to construct Utopian communities have all failed,[1] as have more ambitious attempts to design an ideal state. In both cases, the result is due to a failure to take account of human needs and preferences.

At the other extreme, development can take place entirely in response to known human needs and preferences: not a few human institutions have been designed or have evolved in this way (brothels, gaming-houses, bingo-halls, etc.). The reaction then may be that such institutions are among the 'worst' features of society, that they betray human nature by pandering to its lowest elements, and so on. These criticisms imply a view of what human nature 'ought' to be.

The fact that plans which do not take human beings sufficiently into account are inadequate may mean not that they are basically wrong, but that they have been introduced wrongly. Human beings appear to be extremely flexible, and will adapt themselves to almost anything if it is done gradually. There are obviously biological and physical, as well as economic, constraints which limit adaptability; how strong and permanent these are is not really known. (Desmond Morris[2] may exaggerate their strength and basic nature, but this is probably a useful corrective at the present time.) Whether human beings adapt to a system or not, any system is bound to affect them, perhaps in ways which no one predicted or wanted.

All three main approaches to system building—the short-term solution, the planned Utopian and the unplanned evolutionary—have serious disadvantages. If a system can be planned, but planned in accordance with knowledge of human behaviour and needs (individual and social), as a basis for seeing both what may be usable and what may be the effects of the system, it should be able to have most of the advantages of both the Utopian and the evolutionary without their deficiencies.

This does not solve the dilemma of 'is' versus 'ought'. How far human behaviour *can* be changed is one question (presumably answerable, though very hard to answer); how far within these limits it *should* be changed is quite another, which brings in value judgments.

The present information system is mainly of the evolutionary kind; though a lot of detailed and short-term planning has gone into bits of it, there has been almost no attempt at overall planning, and the planning has been aimed mainly at the solution of technical problems (or at mere technical refinements—problems have not always been there to solve). There is certainly a very serious general problem to be solved (if one takes the primary publication system as given—if one doesn't, there are a lot of bigger practical problems to be solved!) from the volume of literature, its scatter, language problems, and other well-known factors.

Information systems, and to a lesser extent, library services, are undergoing at the present time more rapid changes than ever before. These changes have been caused by technological advances, social pressures, and the sheer growth of recorded knowledge. These three factors are of course interlinked. I will not go into their nature and relationship here, merely note that they exist. My point is that changes in the information system are mostly unplanned in any but a short-term sense, and that they take no account of people as they are. Long-term Utopian planners like Licklider,[3] on the other hand, seem to be planning systems for Utopian planners like Licklider to use.

If we look at some of the problems associated with libraries and information systems, it may become apparent how they could be approached with the help of psychology and sociology.

In the first place, what attracts people, or does not attract them, to libraries? The factors that draw them in initially may be rather different from the factors that induce them to come again. It is known that the public library's clientele is selective, and that even within the selective groups some people never come near the library. Some of the explanation may lie in the physical siting of the library, but even here the distance people are prepared to travel to libraries is at least partly a psychological and sociological matter. To quote from one of the reports commissioned for the U.S. National Advisory Committee on Libraries:[4]

> But even if consensus is reached on defining users *descriptively* there still remains the problem of finding out *why* particular classes of users and non-users behave as they do. The *why* question is far more difficult to deal with than is the *how many*. In order to find out *why* library users and non-users behave as they do we must begin to focus attention upon the complex inner structure of individual motivations along with determining their social characteristics.
>
> Let us cite an example. If we know that proportionately fewer Negroes than Whites borrow books from public libraries, we can explain this on one level. Negroes do not have the same educational opportunities as Whites, they therefore are not as 'book-orientated' as Whites; therefore Negroes 'use' libraries less frequently. This is a plausible 'why' interpretation; but it does not explain the fact that many Negroes do use public libraries, while many Whites do not.
>
> Obviously we need more than demographic descriptives here.

> In the very least we must look into the following form-types of psychological variables that would go a long way in answering why different sub-groups in the population behave as they do. Critical to the *why* question are observations relating to people's
>
> 1. Assumptions, beliefs, and presuppositions. These often are more determinant of behavior than 'objective' facts.
> 2. Frames of reference attitudes. These are psychological 'tendencies' or dispositions to react and to behave in certain relatively fixed ways.
> 3. Sensations, images, and feelings. These relate to the inner experiences and 'pictures in the mind's eye' that various stimuli (i.e. libraries) generate, and they are most important in motivating people to react to the stimuli either positively or negatively.
> 4. Gratifications. These are the symbolic as well as actual satisfactions that are derived from given experiences.

The hoary argument as to whether academic libraries should be centralized or decentralized has many facets. Most librarians seem to regard it as closed, except that academics *will* go on wanting books near to them, in smallish compact collections. Rosenberg's[5] and Allen's[6] work should be taken into account here before we decide once and for all that academics are being lazy or obtuse. We have after all tried to convert them to better habits over the years, and the fact that, in some conditions at any rate, we have not succeeded should be a warning that we may be dealing here with some immutable characteristics of people, which we must simply accept. If, for economic or other reasons, centralized libraries are necessary, it may be possible to keep users happy by a rather different organization of the Central Library in accordance with their requirements—once we know what these are.

Within the library, how should seating be arranged in relation to bookstacks? Sommer's[7] work on seating preferences is of relevance here; he shows, not surprisingly, that needs are very varied, and the conclusion I would draw is that libraries should offer a much wider variety of choice than is usual, from six-seater tables to hermit cells. (A later piece of work,[8] which shows that working on a bed produces similar academic results to working at a desk, would suggest that the installation of beds in libraries would be desirable, and would help at the same time to solve the accommodation crisis in higher education.)

I am not suggesting that librarians are not conscious of the importance of psychological and social factors; it would be hard otherwise to explain why we pay so much attention to library display and aesthetic appearance. What we do not know is whether our efforts work, or whether they are made in the right direction at all. We do not know what part pleasant service plays, compared with a large stock, an attractive building, or sheer efficiency. A little effort in the right direction might do more to attract and retain users than any amount of well-intentioned effort in wrong directions.

Another old issue is the broad *versus* detailed shelf arrangement. There are several facets to this particular problem, which I have touched on elsewhere;[9] I would only say here that I do not see any way of solving it without the help of psychological studies, for example into the memorability of shelf-marks, the ability of users to comprehend their order on the shelves, the number of books within a category that can be readily comprehended by users, and so on.

It would be useful here to distinguish between what I might call subjective and objective usability. Subjective factors decide whether something is used at all, or used more than once, or used with pleasure. Some things—e.g. UDC classification numbers—*look* offputting, and if users are put off something, they never have the chance to find out whether it is in fact easy to use or not. Objective factors include memorability, comprehension, error rates, speed of use, etc. These are technically easier to determine, though the work involved in determining them can be very large and require complex controlled experimentation.

More fundamental questions in classification relate to the conceptual structures by which people organize knowledge within their minds, and how these relate to the subject arrangement, not merely of libraries, but of indexing and abstracting tools. It may be that the conceptual structures of users exhibit so much variety that few useful conclusions can be drawn; or that, if they show a strong resemblance to Dewey, it is because prolonged exposure to libraries has made them look at knowledge Dewey-eyed. The *actual* structures (which could be partially studied by an examination of the personal indexes and reference systems of those users that keep references) are different from the structural *patterns* of knowledge: the way in which the human brain organizes information in order to store and retrieve it. The suggestions made in this connection by Norman[10] are most interesting: he considers the operation of memory (both short- and long-term), and the mechanisms of storage and retrieval, and then discusses the implications of this for the design of future libraries and information systems. His views are not universally agreed among psychologists, by any means, but his approach seems to me potentially a very valuable one. For example, if his view is correct that we 'organize into categories with a limit of about five items in one category' and that hierarchies have to be established in the memory, with no more than five items in each group, sub-group, or sub-sub-group, this is surely of extreme importance for the design of classifications.

To move from classification to catalogues. Some of the major problems include whether catalogues should be primarily arranged by author or by title, and whether subject catalogues should be classified or alphabetical. We now know from several studies that people remember title more accurately than author.[11, 12] A few well-designed studies into the classified/alphabetical subject catalogue question could help settle this question too (I say '*help* settle', because there is also the question whether subject catalogues are intended for users to operate direct, or for library staff to operate on behalf of users). The Aslib/Cranfield studies, among others, have already shed some light on the relative effectiveness of different methods; we now need light on the relative usability, bearing in mind the distinction I made earlier between subjective and objective usability.

The physical structure, layout and appearance of catalogues have received little detailed attention so far. Again, I am not saying that librarians do not consciously try to make their catalogues as beautiful and functional as possible, only that they (and 'they' includes me) have little or no idea whether their beauty appeals to the beholder or how they work in practice. What, for example, is the relative speed of access to a printed as opposed to a card catalogue? What errors of use are made in each case? It may be that a card catalogue is best for a specific item search, a book catalogue for a subject search: *we do not know*. What filing arrangements are comprehensible to users? Would some of the simplified filing rules suggested for computer sorting really make things better or worse for the user?

This leads me on from conventional library tools to secondary information tools such as abstracts, indexes, and so on. The points I made earlier about the subject organization of information within the mind are relevant here. Indexing and abstracting tools, and for that matter bibliographies in book form, exhibit a wide variety of arrangements. It is highly improbable that, for example, chemists organize information in totally different basic patterns from engineers, or that the users of *Sociological Abstracts* are a different breed from the users of *International Bibliography of the Social Sciences: Sociology*. But until there is some better theoretical and experimental basis on which to plan these services, we can hardly blame their planners.

In one sense, however, we *can* blame them. Since no one knows whether one type of arrangement is better than another, there is a good case for rather more standardization, on the grounds that a variety of arrangements of unknown utility is much more confusing to the user than one arrangement of unknown utility. Even when an indexing tool uses the same *structure* consistently, index *terms* for the same thing tend to differ from volume to volume. There may be good reasons for this, but the utility of improved subject entries should be weighed against the utility of consistency from volume to volume.

The physical design, layout, density, typography and so on, of secondary tools could well receive more attention. Presumably some arrangements are clearer, and quicker to use, than others. It would not require tremendous effort to study this, and indeed some work has already been done in this area, for example by Drage[13] on user preferences in the layout of indexes, and by Slater and Keenan[14] into the arrangement and format of *Current Papers in Physics.*

A more general problem concerns the sheer proliferation of secondary tools. The number of indexing and abstracting journals, or journals containing index or abstract sections, is now about 3,000—this was the number of *primary* journals 100 years ago. It is easy to see how this has happened. The expansion of recorded knowledge on the one hand, and increasing pressures on the time of users on the other, have stimulated the growth of secondary tools—an almost totally unplanned, unco-ordinated and piecemeal growth, which institutions and governments have fostered for the best of reasons, and publishers for less altruistic reasons. This growth of secondary tools has solved nothing at all, except in the short term for small bodies of people. In the first place, they do not, except in very rare cases, even attempt to supersede, or compete with, previous systems; the situation is quite different from that of the new washing powder which competes with old washing powders. They therefore *add* to the number of systems to be used by the individual. But if he uses several, he will find a lot of the same references cropping up in them all, so that each additional one he uses brings less reward for his effort. Moreover, even if he uses ten or even twenty, he will still miss something. On the other hand, if he acts as if the new system does supersede others, he will miss a great deal—perhaps more than 50 per cent of relevant material.

In recent years, the printed 'current awareness' services that have begun to proliferate are not so much arranged as strung together, and usually have to be read right through to make sure you are not missing anything. If you get a month or two behind, catching up is very laborious. If your field is interdisciplinary, you may have to use two or three of these current contents journals.

So the computer has been brought in to help. The ways in which it does this do not need stating here. If it is used to speed up publication of indexing journals, the choice lies between manual indexing and computer indexing on the one hand, and computer typesetting and direct computer printout on the other, the combination of manual indexing and computer typesetting being the most expensive of the four alternatives thus offered, and computer indexing and computer printout the cheapest.

Whether a computer-based system offers a current awareness service or retrospective searching, numerous problems arise; not merely the well-known problems of profile-construction and recall/relevance, but problems of overload. The retrospective search in particular corresponds to nothing a researcher would ever do naturally, except perhaps a Ph.D. student starting on his work, or an experienced man writing a comprehensive literature review. Normally, a researcher searches a bit, reads a bit, thinks a bit, experiments a bit, writes a bit, searches a bit more, and so on; he wants his references in drips rather than lumps, which tend to clog up his intellectual works.

The poor researcher is then faced with a large number of different published indexing systems; to use any of these effectively is not easy, to use them all effectively impossible. If he does attempt to do so, he will have little time left to spend actually doing research. Alternatively, he can go in for a computer retrieval system. He will soon be faced with a fair range of these too, and it is a good bet that these too will overlap, leave gaps, require different approaches, and be difficult to use. When he does use any of these systems, they will lead him to a far wider range of primary literature than he has been accustomed to using, scattered through anything up to 1,000 journals (not to mention conferences, reports, etc.).

This system is not one it would have been thought necessary to invent if it did not exist already. It combines some of the worst elements of Utopian planning—in attempting to achieve comprehensiveness, for example—with some of the worst elements of short-term expediency.

Developments in the secondary system have been paralleled by developments in storage of primary material. Prophecies have been made for at least thirty or forty years that microfilm will supersede ordinary print to a large extent. Its advantages are of course well known; many of these are still greater with ultrafiche. There is only one snag: *people simply do not like using microfilm.* A recent user survey of microfiche[15] records some illuminating comments from users, most of whom were either positively antagonistic or apathetic:

'Anybody who strikes a blow against microfiche can't be all bad.'

'Everything about microfiche is marvellous . . . except using it.'

'Microfiche is an information burial system.'

The writer of the survey, Harold Wooster, comments:

> 'The 47 per cent of individual users who disliked, detested and despised microfiche did so for the following reasons, ranked in descending frequency:

1. Unavailability of, or difficult access to, readers for their own use.
2. Inability to make notes on fiche.
3. Poor optical and mechanical quality of readers.
4. Can't read fiche at home, on airplanes, etc.
5. Can't flip pages, refer back and forth from appendix to text.
6. True cost of blow-backs is probably greater than 25¢ a page, especially when scientists or engineers must operate the reader–printer themselves, as is frequently the case
7. Print-outs after you get them are unwieldy, thick, curl up into Dead Sea scrolls.
8. Personal reading rates are slower.
9. Can't read and work with graphs, tables and continuous tone photographs, especially with negatives when they're accustomed to reading positives.
10. Can't identify fiche by color and physical location. Can't scan quickly.
    Poor indexes to what's available on fiche.
    Hard to store.
    Can't read titles without readers.
    Lack of standardization in fiche size (e.g. COSATI vs. Industry vs. IBM standards.)'

To these disadvantages I would add one other: that microfilm does not *invite* use, you are not exposed to it in the same way as you are to books. Microfilm is however at least something you can see and handle. Some solutions to the book storage problem involve the storage of information in computers, or at long range in computer-controlled stores, accessible by facsimile transmission. The remoteness and intangibility inherent in such systems are somehow vaguely alarming: how can you control and use something that can't be seen, and that has to be approached in very special ways? I suspect there is something more in this than a threat to one's security. After all, we have all been brought up in an environment where we have been *exposed* to information visually over long periods. We have thus acquired a personal internal store of information; much of this store may be little used, but from it we draw the words, symbols and ideas by which we may obtain access to other, external stores of information. Now imagine, if you can, someone who has been brought up without such visual exposure to information; who has not been able to browse or pick up snippets of knowledge from books. How can he obtain access as an adult to a computer-stored information system? The store from which he must draw his access points must be a very impoverished one. This is an extreme case, and I do not for one moment imagine it will come about; but I do believe there is a serious danger that prolonged use of a computer system could narrow one's horizons and range of interest in a way that could be very damaging to the progress of science, the major advances in which are made by the imaginative leap, the seeing of similarity in two apparently disparate areas, not in 'crawling along the frontiers of knowledge with a hand lens', as Sir Eric Ashby has neatly put it. It is interesting that at MIT, where TIP, the fairly sophisticated on-line computer retrieval system in physics, has been in operation for three or four years now, some physicists still prefer browsing in the library.[16] It will be even more interesting to see how experimental interactive systems, by which the computer can actually provide some browsing facilities, work in practice. I suspect that, for at least a long time ahead, the sheer complexity of operating the system will present a very formidable barrier. The user will probably have to choose between using a highly structured language which the computer can handle tolerably easily, and using natural language, which will require very much more elaborate and expensive systems, which in turn may require a more complex mode of working—by the time an interactive system has got round to understanding exactly what its innocent user really wants, he may have been infuriated to a point where he reverts to his old habits of asking Charlie or looking through a few selected journals. Some current experimental on-line systems demand a high degree of accuracy and persistance from the user, not to mention practice and familiarity. At present, one writer claims that 'Existing machine searching systems have physically and psychologically enlarged the gap between the reader and the information store.'[17]

Miller[18] has posed another objection to the invisible store of information: that it lacks any spatial frame of reference. Unless information can be *located* somewhere, unless the user can visualize its place within a book, or a library, or whatever, its accessibility is greatly reduced. We are all familiar with this phenomenon in the form of the angry user who asks where his books have been moved to now; if they have been reclassified, it is far worse for him than if they have simply been moved, since the spatial frame of reference is totally lost in the first case. This may account for some of TIP's non-users. There is, as Miller points out, no particular reason why libraries and information systems of the future should not take account of this factor; the fact is that up to now there is little sign that system designers are aware of it.

Let us have a closer look at our user. Users are not, I would remind you, some special kind of animal, but ordinary human beings, exhibiting the infinite variety of human nature. In certain environments—research establishments, for example—it is true that users may have some characteristics in common, such as (presumably) reasonable intelligence and a concern with the same subject areas; but there will inevitably be a wide range of personalitities and behavioural patterns.

By now, a great deal is known about individual human psychology and the behaviour of human groups. Unfortunately, there has as yet been little serious attempt to apply this knowledge to information use and transfer, although they are clearly matters both of individual psychology and group behaviour, and one would expect such a study to be potentially very fruitful. It is true that we have, thanks especially to the American Psychological Association's studies of the last few years,[19] a collection of data on patterns of information transfer, ranging from informal communication at conferences to the process by which research gets published and what happens to it then. This is very useful background material concerning what actually happens, and it provides a useful check on hypotheses as to what sort of system would be acceptable in practice. However, large-scale studies of this kind cannot provide the psychological and sociological data required for the sort of study I am suggesting.

More directly to the point at issue is Allen's[20] work on information flow in

R and D laboratories, which uses sociometric techniques, and demonstrates the extreme complexity of transfer. Also relevant is the work of Rosenberg[5] on factors which affect the preference of industrial personnel for information-gathering methods.

All these studies are valuable, starting as they do at the operational end, as it were, and more are needed. However, parallel with this research, I would like to see work starting at the theoretical end, testing hypotheses derived from sociological and psychological theory in different situations and environments. Most studies have up to now been carried out by persons without special training in sociology or psychology, and consequently have severe limitations. They have the further limitation that what people do is inevitably constrained by what there is; the present range of choices is limited, and we cannot tell from user studies what users might do given new choices or possibilities. User studies are of little *predictive* value.

A useful programme of work would include the identification of potentially relevant findings and theories from sociology and psychology; a review of what is already known about user behaviour; a bringing together of the two, leading hopefully to the development of specific theories and hypotheses concerned with information use, and the refinement of techniques of testing them; and the design of a series of studies.

Such a programme of research is not merely an interesting exercise: it is essential if we are to find out enough about users to build systems suited to them, instead of designing systems (or making them up as we go along) and then hoping to goodness they can be used. As I have suggested, even on a commonsense level the present system makes very little sense, even less sense when one considers the little knowledge we do have already about users and their information habits.

First, it appears that a very high proportion of all information, even at a research level, is not acquired directly from documents at all, but informally—through correspondence, meetings, and ordinary conversation. This fact surprises most researchers until they observe their own behaviour; the seeking out and perusal of a document are more positive acts than a casual conversation, and thus assume a prominence in the user's mind which is not justified by the facts. There are fairly obvious reasons for preferring informal communication. It is usually easier and pleasanter. It gives a rapid feedback, so that if one does not start quite on the right wave-length it does not matter much—contrast formal systems, whether computer-based or printed, where a wrong initial approach yields no results at all. It brings added dividends, in the form of additional information which the person contacted believes will be of interest. It may lead to further contacts. It has a stimulus value lacking in much formal documentation. All these rewards are immediate, and although formal documentary systems have their own advantages, the fact that the rewards are less immediate is alone a sufficient reason why informal systems are preferred: given an immediate reward, however small, most people will prefer it to the possible long-term reward. I would incidentally expect learning theory in general, and in particular the role of rewards and reinforcement, to be capable of a number of fruitful applications in the study of information transfer. (The offer a year or two ago by the Librarian of Cambridge University of prizes for successful catalogue searches may perhaps be regarded as a primitive attempt to apply learning theory to library use.)

The main reason, however, why informal systems are preferred is the second fact that can be regarded as reasonably well established: most researchers suffer from (or perhaps enjoy) an astonishing degree of inertia. This is not quite the same thing as saying that short-term rewards are preferred to long-term rewards. It is more like Zipf's law of least effort. It has been shown that, given a choice of going next door with a small probability of obtaining relevant information, or indeed much information at all, and walking a hundred yards with a much higher probability of success and quantity, people go next door.[5, 6] They may never go beyond next door, and if they do they generally go next door but one. They may eventually go the hundred yards to the good source of information, but only after exhausting all the closer sources on the way. Expected ease of use, as well as physical accessibility, has a much higher priority than the expected quantity and quality of information. This should not incidentally surprise us: on a more mundane level, I sometimes go into extraordinary contortions to reach something nearby without getting out of my chair, when it would be much more sensible to walk a yard or two.

Among the reasons why informal systems are preferred, stimulus and enjoyment were suggested. Human beings have a great need for both, but here we have a dilemma. For vast amounts of relevant information to be transferred at all, some condensation is required; but condensation usually makes information neither acceptable nor memorable. Protein tablets and other packaged forms of food may give you as much nourishment as a good meal, and they certainly take much less time to eat, but they are hardly as satisfying; nor will you return to them again until you are really hungry. Information as a stimulus can be considered from two aspects: if information is not inherently stimulating, people are less likely to use it at all; and the process of stimulating thoughts and ideas is one of the most valuable properties of information. We must at all costs avoid the concept of information as mere lumps of facts and data.

The preference for informal systems has several practical implications. Is it possible, for example, that informal information transfer could be organized in such a way as to enable it to partake of some of the advantages of the formal system? Or can the formal system be so re-designed as to have some of the important properties of informal transfer?

What has been discovered about informal transfer has other interesting aspects. De Solla Price has written a good deal about the 'invisible college', the group of individuals, often scattered quite widely, with a specific common interest, exchanging correspondence and previews of forthcoming articles and quoting each other's works; with a membership which is flexible but not easy to break into, while the penalty for remaining outside is to be out of touch with the latest work in the subject.

The preference for informal communication also means that the isolated worker, or a team composed of as few as two or three individuals, is at a great disadvantage compared with the team of five or six. The chances of stimulus and new ideas are greatly reduced with small numbers. Very large teams create their own problems of communication: there seems to be a fairly narrow band of numbers which is the optimum size. Teams also seem to throw up regularly one member who acts as chief communicator, both from the inside going out and from the outside coming in; it is he who has most contacts, and he is the person to whom members of the team turn automatically for information.[20] Whether groups tend to recruit these 'gatekeepers', or grow them at home, as it were, is not known; it is evident that they have certain characteristics of personality that distinguish them from other members. Any formalization of an informal system would clearly have to make use of gatekeepers, as well as of invisible colleges.

At present even the formal system—of documents, libraries, and secondary tools—receives a great deal of informal use. A study carried out at Johns Hopkins University some years ago indicated that 18 per cent of books borrowed from the University Library by scientists were items that they did not go there specifically to find.[21] I have been told of a university researcher who, on parking his car each morning, noted down the numbers of adjacent cars and then went to the Library to look at the corresponding Dewey numbers, rarely failing to find something of interest. Purposeful browsing and, especially, serendipity both benefit from a certain element of randomness. I know that in my own work I would like to have everything—yes, absolutely everything—in a very narrow area, a careful selection from peripheral areas, and random exposure to other areas. From the last comes at least occasional entertainment, often stimulus, and sometimes a real shaft of light on my immediate work—the perception of a link between two apparently different fields, a striking analogue, a technique developed originally for other purposes but potentially useful to me. The point of this is that computer retrieval systems aim to *eliminate* randomness, whereas they are almost uniquely suited to providing a random element in addition to specificity. It is interesting that, with the increasing specialization of periodicals, the random element is now being catered for by such journals as *New Society* and, increasingly, by newspapers such as *The Times* and *The Sunday Times*, which have semi-popular scientific snippets or even full-page articles of a kind that was very unusual a few years ago.

Over the years people have developed ways of using libraries and information that, viewed rationally, appear rather clumsy. What is not known, and what must somehow be ascertained, is how far these habits are the products of basic psychological characteristics which are not subject to change, and how far they can be modified by a different system. As pointed out earlier, human beings are certainly immensely flexible, but they have a way of appearing more flexible than they are; many radical innovations have after a few years turned into something remarkably like what would have evolved anyway from the previous system. One implication of this phenomenon is of course that no system can be properly evaluated until several years have passed and all novelty has worn off.

There must be individual limitations which cannot be trangressed. For example, there must be limits beyond which individuals can no longer take in information. Some research has been carried out into how many articles the average scientist reads a week, but not into how many pages of solid matter he *could* read in an average working week. Obviously there must be huge variations here, not only between but within individuals (according to their health, motivation, etc.); but within the variations there must be a band within which most researchers fall, and if an information system consistently exceeds the upper limit of this band it is failing to meet a basic criterion.

Actually, one wants to know of the newer methods of transferring information, particularly those using computers, not merely whether they will demand changes of such a nature or magnitude as to be unacceptable (except in the short term when they are fun to try out), but whether the changes they may induce will be such as to do damage, for example by reducing stimulus and browsing possibilities. Undoubtedly some very large changes *are* possible in information use: consider, for example, the medieval monk working in solitude, and compare him with the gregarious conference-goer of today. There are of course excellent social reasons why this particular change has occurred, and in any case the Middle Ages were hardly notable for intellectual progress and creativity, but the point I want to stress is that it has been possible. How much change is possible *within* a society, rather than between societies, is another matter.

It is interesting in this context to consider the technological advances that have brought about significant changes in behaviour, and those that have not. The invention of printing is perhaps the most significant invention of this millennium in its impact on human beings, individually and in groups. More recently, the invention of electrostatic copying has had an effect on information habits: whereas previously users would read an article in the library, or borrow and return it, in either case making an abstract if it proved useful, now they tend to make a copy (at someone else's expense usually), and after a quick scan file it away, thus building up their own selective personal libraries, half-read. They probably read rather less and scan rather more. The growth of paperback publishing may have had a rather similar effect. If I am right about this, the explanation may be partly that it is one means of coming to terms with an increasing volume of literature, so that an interaction is occurring: the growth of literature stimulates use of new technology, which therefore accelerates, changing in turn the use of literature.

Developments which have *not* (yet, at any rate) altered significantly information use or habits include microfilm and programmed learning. I suspect several of the newer media will never catch on, not because of any technical deficiencies but because, for reasons which may not always be easy to specify, people do not use them.

There are obvious limitations to the study I am advocating of the psychology and sociology of information use. I pointed out earlier that users are simply human beings; and information use is a very personal matter. It might well be established that there was a clear relationship between certain psychological characteristics and information use[22]—for example, that extraverts showed important differences from introverts, or convergers from divergers, or stable personalities from neurotic ones, or even men from women. This would be fascinating to find out, but of no conceivable use to anyone: I cannot imagine a special abstracting service for neurotic extravert women, or special libraries for stable convergent men. Nor would investigations into, for example, the eye-blink rates or galvanic skin responses of individuals confronted with the *Science Citation Index* be of great value. What should be looked for is the characteristic or reaction that is universal or extremely common; for example, it might be shown that 70 per cent of users preferred one form of layout of an index to another. One possible practical solution to the growth of literature is an increase in reading speed that newspaper-style printing would offer: given a careful layout, it might be possible to absorb information, at least in a superficial way, much faster from a newspaper page (containing the equivalent of perhaps twelve normal pages) than from twelve separate pages, and in peripheral areas this could be valuable. (It could incidentally also cut publishing costs, particularly if the originals were stored centrally and the 'newspapers' printed on ordinary newsprint paper.)

At a more fundamental level, little is known about the effect of different kinds of media on the learning process. It is possible that in the next few years books will give way partly to various audio and visual devices. One would expect this to benefit those who take in information readily through the ear or in pictorial or semi-pictorial form, but the prolonged visual exposure permitted by the book may have great advantages, e.g. in 'imprinting' something to be memorized on the brain, which should not be lost. In fact, it is probable that different sorts of information are best suited to different media, and future developments should take account of this.

Obviously, in the last resort, when we have found out all we can about users, no information system can be designed entirely around them, since it is inevitably bound by practical constraints, chiefly (but not entirely) economic, technical and physical. However, unless users are fully considered, a system may fall well short of full utilization: it will be used if it is the only alternative, but even on strict economic grounds it would make sense to ensure that it was as fully used as possible (particularly in the case of libraries, which represent expensive capital resources.)

It may be that at the end of prolonged (or perhaps not so prolonged) study there proves to be an irreconcilable conflict: a system, to be fully effective in retrieving information, may require a very high level of sophistication, which makes it unusable by most people, while a system to be fully usable must remain at a primitive level of development. I suspect this may indeed be so, but it is no cause for despair; indeed, if we know it to be so, we could probably make much faster progress, on the understanding that there must always be a human intermediary—the information officer—between the system and the user.[23] The system could then be developed to any pitch of sophistication, without any breach of the rules about accessibility and usability.

I am aware that I have ranged over a very wide area in a very superficial way. The points I have made are not new. Rees and Schultz[24] said a few years ago: 'If we are really concerned with facilitating information transfer in order to improve the research productivity of scientists and engineers, then it is profitable to turn at least some of our attention from the fashionable pursuits of debating the respective merits of classification schemes, subject headings, thesauri, links and roles, and the like, and to consider the psychological and environmental variables which determine the need for, and processing of, information.' Cavanagh[25] too has discussed some of the issues I have raised. I would like to emphasize my main points. The first is a general principle, that information systems should as far as possible be built around users. The second is that systems inevitably affect use and users, and we should ensure that the effects of changes are desirable ones. The third is that the application of psychological and sociological theory and methods to information systems could help to guide us as to their development.

Dr Urquhart has his own favourite psychological theory, of the 'manurial value of pure rubbish'. The really bad article or paper stimulates the production of adrenalin in the reader or hearer, and hence provokes him to ideas and arguments that would otherwise never have entered his head. May I hope you have found this paper profitable on these grounds, if on no others?

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DISCUSSION

MRS M. P. FOWLER (Imperial College) said that she could not see why readers were so impatient in libraries and why they did not allow themselves enough time before obtaining a book. Why did they not realize that 30 percent of their time in a library would be spent in trying to obtain the book before they could absorb it?

MR LINE said that readers were impatient because trying to obtain books was a boring business. One should not expect users to enjoy working a library system. But it would be interesting to know why such people would spend hours queueing for a pantomime and yet would only wait a minute for a book.

ANN SUTHERLAND (Tavistock Institute) wondered whether the frustrations of the library staff and the users could be solved by better 'induction-to-the-library' procedures. MR LINE said that this was perhaps an answer, but he had little faith in library-induction courses, except to break the ice: the only way people could learn to use libraries was by actually using them, if necessary with the continued help and guidance of the library staff.

MR A. E. STANDLEY (West London College) said that he greatly welcomed Mr Line's paper. He had not met before a serious public discussion of the need to investigate the psychology and sociology of librarianship. He mentioned that it would be interesting to investigate person-to-person confrontations between library and information workers and their users. MR LINE said that some of the skills required of library staff were similar to those required for social work: sympathy, ability to identify the problem, patience, etc. Skills of this kind had been somewhat neglected.

LT COL J. C. R. HEWGILL (Ministry of Defence) said that an Operational Research Society R & D Working Party was preparing a survey of R & D workers to try to establish what input and output were used and how they related to personal circumstances, environment and preferences/desires.

MR D. W. ALLEN (CERL, Leatherhead) asked if a questionnaire treated the user as a black box. To what extent were personal factors invalidated in anything more than a personalized system. There seemed to be a contradiction between disallowing the treatment of the individual as a black box by the ORS and the sort of studies which had been proposed for the theoretical basis of an information system. MR LINE said that this depended on what Mr Allen meant by a black box. Some questionnaires could certainly probe pretty far into the black box of the user; and, in any case, psychological studies did not need to confine themselves to questionnaires. If one could find out enough about basic human characteristics as they affected information use, then one may not need to study users in the act, as it were.

MR R. A. NIGHTINGALE (BP Trading Ltd) asked if the speaker thought that the move towards on-line information systems was inevitable in view of his statement that some physicists at MIT had abandoned the use of the TIP Project in favour of the library. MR LINE said he thought it was inevitable, but one should make sure that it was the right kind of on-line system, and that it did not attempt to do what conventional library use may be able to do much better.

MR R. A. FAIRTHORNE (Independent) said that discussions about 'information', 'data', and so on, were vacuous unless 'information', 'data', etc. were defined. There were at least five acceptable meanings of 'information', all of which were distinct. Which one was meant was often clear from the context, but not always, as was the case here. One should be clear about whether one was speaking of the text, i.e. the words and symbols used; of the interpretations of that text, i.e. what they meant; of what the interpretations refer to; inferences from these, and so on. What people may say may be factual statements, but they were not necessarily facts, e.g. limericks. All that librarians could supply were representations of what people had said.

TASKS AND THE ANALYSIS OF LIBRARY SYSTEMS

P. A. THOMAS

Aslib Research Department

SOME while ago, in an attempt to improve communication between members in the Research Department, we published some comments in *Aslib Proceedings*[1, 2] on the terminology of the analysis of library systems. We were not in any way advocating a standard use of certain expressions, only trying to reach some mutual agreement on what we meant by the words we were actually using in our studies of various libraries, and offering the result in the hope that it might prove interesting or useful to others. One of the projects mentioned then, concerned with the use of bibliographic records in libraries, has progressed to a stage where some extension of our original comments can be made.

Current interest in the possible application of management principles and techniques has resulted in renewed discussions of library objectives and services and revealed some lack of definition and agreement. It can be useful to regard a library as a formal organization and so make use of the theories and principles developed in more general studies of organizations. W. Boyd Rayward, in an article on 'Libraries as organizations'[3] declares that there seems to be a general lack of knowledge concerning the functions, limitations, needs and potentialities of libraries and that there is a real need to find out what libraries actually do, how they do it, and how what is done varies from one library to another, and from one type of library to another. 'What the librarian wants is a model by which his understanding of the library is adequately represented.'

We have gone some of the way towards providing at least a partial model of a library system. Starting from the assumption of a basic similarity in the housekeeping operations involved in acquiring, processing and maintaining monographic materials, we expected some corresponding similarity in the accompanying paperwork. We visited libraries differing widely in size, type and user populations. The resulting collection of forms showed very little correspondence. Colours, sizes, shapes and information content were all startlingly different. However, we were able to establish a general model of the functions of forms by disregarding their physical attributes and concentrating on the information needs of the procedures rather than the information traditionally supplied and provided for on existing forms. This is essential if paperwork is to function as an efficient operational tool rather than a self-contained and perpetuating occupation.

Basically (because of the emergence of the BNB/MARC communication format) we were interested in the use of elements of bibliographic description (such as author, title, edition) as identifying an individual book at any stage in any of the routine procedures followed in libraries. We also noted the elements of administrative information used in conjunction with the bibliographic elements throughout these procedures. An examination of eighteen procedures, common to all the libraries studied, led us to develop a general operational description of a library system. This is based on the need for and the manipulation of elements of information throughout these procedures. The procedural model displays what records are required at which functional points within the system and can be used in conjunction with the minimal information requirements derived from our earlier analysis.[4] The primary aim was to suggest ways in which certain record making and keeping activities may be reduced, and the model shows where it is possible to make use of information generated earlier in the system without having to rewrite it; and allows us to explore alternative patterns of forms use through the system to allow for any special local requirements.

Stafford Beer[5] has written about what he calls the 'cones of resolution' and suggests that any investigation of an organization will result in a hierarchy of models—working down from the most generalized picture of the situation to more elaborate and detailed levels. The amount of detail finally required will depend on the problems discovered and defined during the early stages of the investigation. We have described the hierarchy of library systems then, as follows. (Fig. 1.)

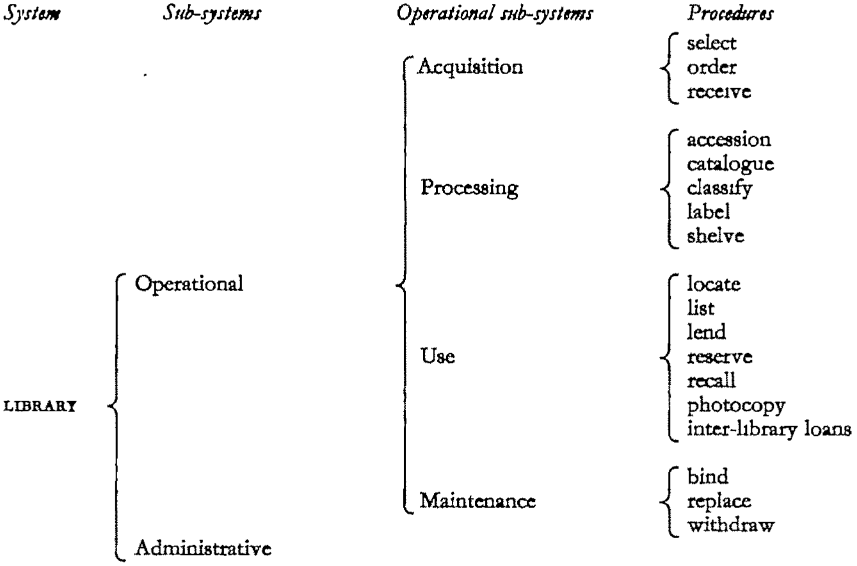


FIG. 1

A detailed understanding of existing procedures in a library is necessary if maximum possible benefits are to be derived from applications of O & M or systems analysis techniques, or from computer feasibility studies. The librarian needs at least enough knowledge to communicate with specialists in these subjects if he is to retain control of his own procedures. As Gilchrist[6] points out, considerable rationalization of the work process can be achieved through the systematic recording and critical examination of procedures, and many management techniques can be happily adapted to library situations. The terminology does not always transplant as readily. The librarian must know what happens in his library in enough detail—to be able to talk about it to people in other professions and to realize what changes may be made, and what effects they would have on other parts of the system in terms of both efficiency and effectiveness.

In our earlier comments on the subject,[1, 2] we were able to draw some parallels between the functions of what we called the 'operational sub-systems' of a library and the functions of an office, as defined by the IOM.

$$\begin{array}{l} \text{Thus} \\ \text{the Library} \\ \text{sub-systems} \end{array} \left\{ \begin{array}{l} \text{Acquisition} \\ \text{Processing} \\ \text{Use} \\ \text{Maintenance} \end{array} \right. \quad \text{have the function of} \quad \begin{array}{l} \left. \begin{array}{l} \text{Obtaining} \\ \text{Receiving} \\ \text{Recording} \\ \text{Arranging} \\ \text{Giving} \end{array} \right\} \text{information} \\ \text{and safeguarding assets} \end{array}$$

In studying the use of bibliographic records, or forms, in a number of libraries we named the first four levels in the hierarchy, from library to procedure. We then analysed the functions of forms in terms of six possible activities, aimed at the accomplishment of the various procedures. It is not necessary for all six activities (initiate, authorize, activate, record, report, cancel) to exist in each of the procedures. For instance, authorization and notification are not always necessary, and certainly do not always require the use of a form. The reading through of an order or selection form can often include a 'mental' authorization of the purchase of an item—considered quite sufficient without any kind of externalization, such as signature or initials on a piece of paper. However, there do not seem to be any other activities necessary, and the function of whichever activities do occur within a procedure is (collectively) the accomplishment of that procedure.

Gilchrist[6] suggests that the next two levels below activities are composed of tasks (such as unpack, check, etc.) and operations or elements, undefined but probably at the more general level of basic human movements like those specified as 'therbligs' in the Work Study environment (reach, grasp, etc.). There are two reasons for developing models—as an aid to understanding an existing system, and as a means of predicting the future behaviour of a system. For both these types of investigation the level of detail required is that of a reasonably standard task. Much work has been done in the industrial sector on the definition of clerical work, and its breakdown into such tasks under the impetus of work measurement and job evaluation requirements.

The IOM,[7] as long ago as 1951, published a clerical job grading schedule that contains detailed specifications for all aspects of clerical work common to many commercial and industrial organizations. Routine library procedures include a great deal of clerical work, and it would seem sensible to make use of as much of the knowledge already gained in clerical job measurement and analysis as possible. The IOM scheme enumerates very many specific tasks likely to be found in offices and describes each in some detail, allocating them to one of six grades according to experience, skill and discretion required for their performance. In at least one situation, the scheme has been extended in practice to include the work of professional staff.

The amount of detail in job analysis must be determined by the purpose of the analysis. There are many possible uses of the resulting analysis; the most well known one of job grading for setting salary scales may not be applicable to the library situation, but other uses include the allocation of jobs on a rational basis of task grouping, discovering training needs, determining and comparing the demands which the normal performance of particular jobs make on normal workers, and ensuring that a job which needs professional knowledge and experience is not cluttered with lower grade tasks.

Our own approach is the traditional library one. We have produced a classification of the types of task carried out in performing the eighteen common procedures. With the additional specification of relevant variables, a detailed task description may be built up for any individual situation. The IOM definition of a task is a 'related group of clerical operations carried out on a particular kind of information'. Our own definition of a form in the bibliographic records' context has become so loose as almost to need the origination of a new word for the concept 'any externalization of information including at least some elements of bibliographic description'. There are, of course, some tasks concerned solely with non-bibliographic information, mainly directed at statistical functions which we would include in the Administrative sub-systems of a library, sub-systems which we have not so far examined and including such things as accountancy, personnel, planning, control. In studying the eighteen operational procedures, we have not found any non-information oriented tasks, which seems to be well in line with IOM thinking.

'Generally speaking, an organization's overall purpose can be achieved only by a factoring of it into "operational" sub-goals, and the pursuit of these through a series of differentiated tasks allocated systematically among members of the organization.'[3] Our eighteen common procedures can be regarded as the operational sub-goals of this quotation. We have not so far questioned the need for any of these procedures, only investigated what has to be done in order to carry them out. We list below a number of discrete tasks, at a level still high enough to be generally applicable to procedural descriptions of most libraries. Their use in an individual situation will need amplification by such situational variables as level of staff involved, equipment used, and the amount of data operated on.

For example: *entering* in formation may be done by professional or non-professional, senior or junior staff; it may be written, typed, punched; one or two elements of information may be required, or very many; and (consequently) a long time or a short time may be needed to complete the task.

These variables will all affect the cost of the task, and so cumulatively the cost of the procedure. One possible use of these task definitions, therefore, is their application to costing. They may be used to describe in precise detail the procedure being costed, and so allow practical comparisons between library systems to be made. They may also be used, as in clerical work measurement, to establish the cost of elements of a system, that can be used to build up the total cost picture, and to supply details for synthetics to be used in predicting the times and costs of a new system, or part of a system.

We have found it convenient to distinguish between tasks performed on actual forms, and those performed on the elements of information contained on the forms. We list below, then, working definitions of fifteen tasks arising from our studies on the use of bibliographic records.

Form tasks

1. *Pass*—forward or send on a form, route by internal or external services.
2. *Receive*—accept a form for processing.
3. *Discard*—throw away, dispose of a form.
4. *Place*—put in a file, or on a desk.
5. *Remove*—take a form out of a file.
6. *Search*—look among number of forms for one form.
7. *Duplicate*—operate a machine to reproduce a completed or master form.
8. *Attach*—one form to another by paperclip, staple, etc.
9. *Separate*—one form from another, includes separation of copies in a set of forms.
10. *Move*—personally to take a form from one place to another (as opposed to pass) usually for the continuation of tasks within the same procedure.
11. *Sort*—place the forms of a file in a new order.

Element tasks

1. *Verify*—compare, check information from one source with another, includes proof-read, and consulting a file.
2. *Enter*—information onto a form, includes annotations as well as original entries—marking, copying, typing, etc. Includes cancellation of an entry in a ledger file by annotation.

3*. *Read*—for interest only, not for immediate action.

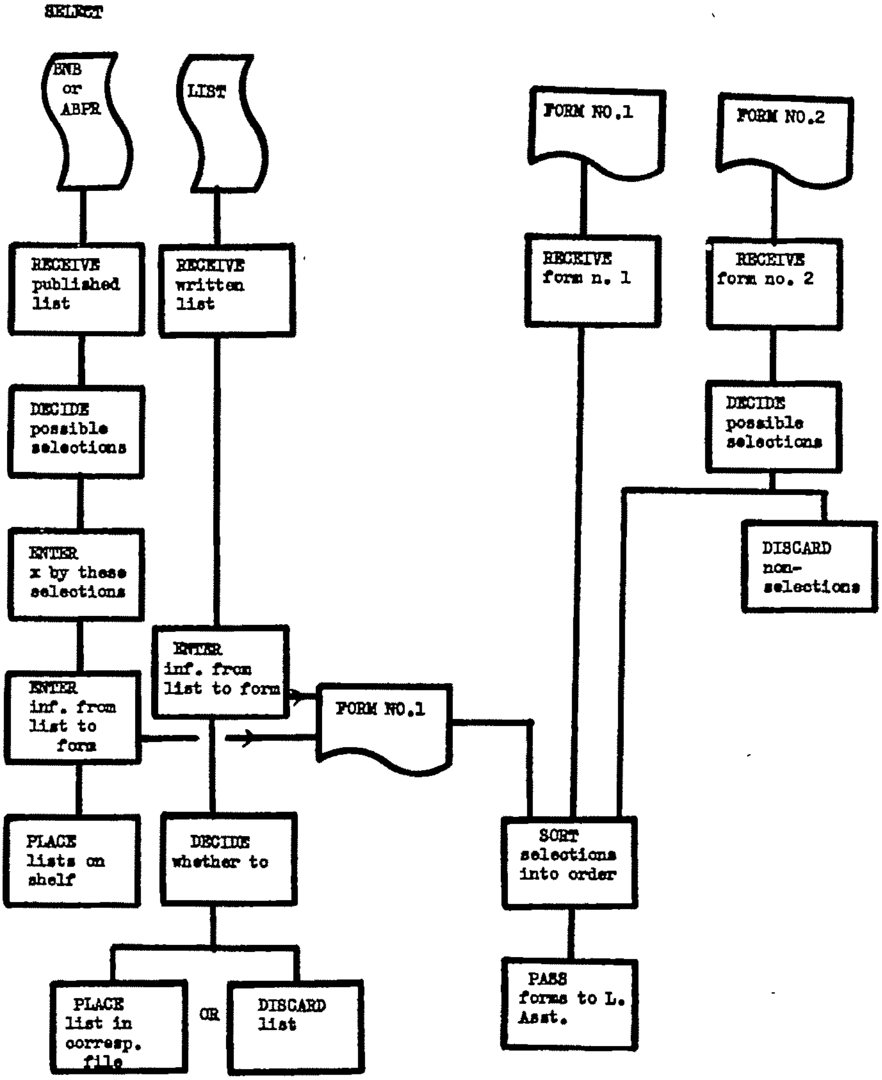
4. *Decide*—what action to take as a result of information.

*NB. *Decide, Sort, Enter, Verify* all include reading, but it exists separately as a task only when no action is intended.

Our main interest at the moment is still focused on the use of bibliographic and administrative elements of information in the library system. The systems studied so far have been manual ones, but a similar approach should be possible to computerized systems. Some of the procedures still apply, and the information needs still exist. Allen B. Veaner has said[8] that 'automation has confirmed the integrity and unity of technical processing', and our studies have confirmed the possibility, and some of the likely advantages, of integrated systems—and perhaps provided a basis for a vocabulary to discuss libraries and their processing needs.

The worked example (see pp 341–2) describes the Selection procedure in a college library. The Librarian receives advice from subject specialists who are members of the academic staff of the college. There are five possible source materials in the procedure; the weekly copies of BNB, The American Book Publishing Record, handwritten lists of requests from subject specialists, book selection cards filled in by subject specialists, and preprinted book cards from publishers. The tasks performed on these different source materials are described in the text and summarized in the accompanying diagram, using the task words defined above.

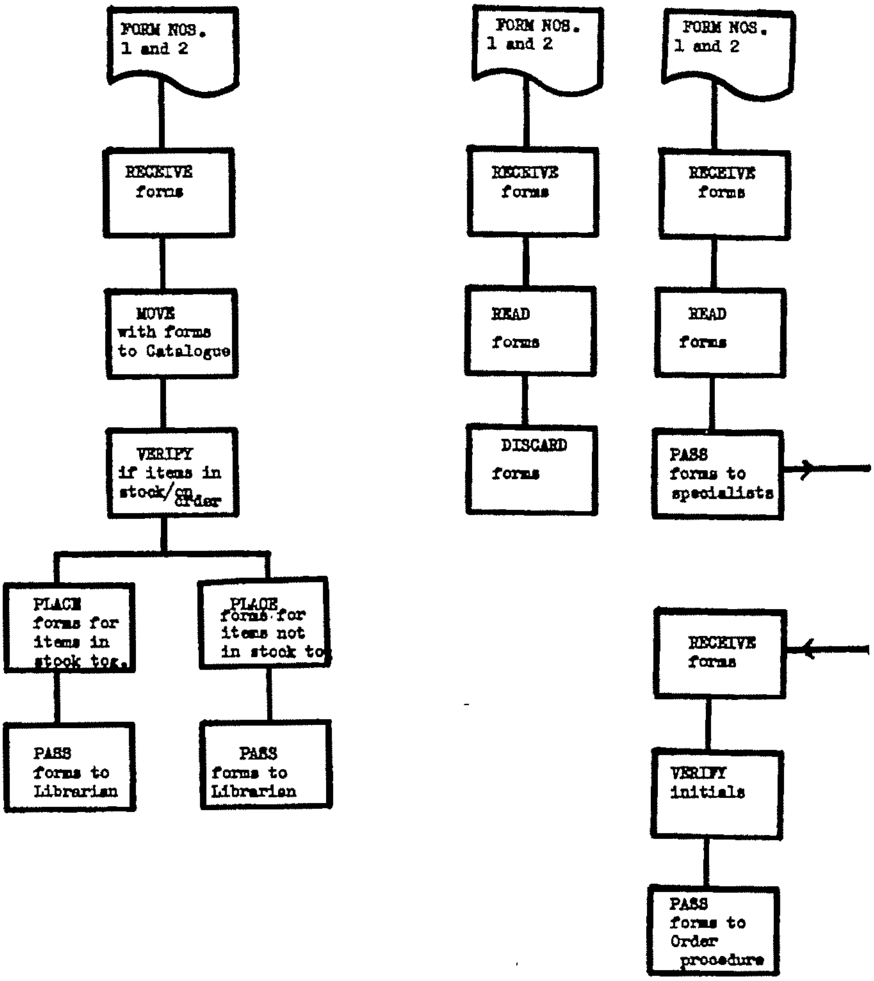
The Librarian *receives* BNB and ABPR. He *decides* which items may be of interest to Department staff and annotates (*enters*) them. He then *enters* some of these details onto the book selection cards, form number 1. The marked copies of BNB and ABPR are then *placed* on shelves in his office.



The Librarian *receives* lists of requests from subject specialists. He *reads* the list, and then *enters* details onto book selection cards. He *decides* whether to *discard* the list, or *place* it in the Department Correspondence files. The Librarian also *receives* filled in book selection cards from the subject specialists, and *reads* them. He then *sorts* all book selection cards into alphabetic order and *passes* them to a library assistant.

She *receives* them and takes (*moves* with) them to the catalogue and checks (*verifies*) them with entries in the catalogue, then *places* them in two piles, books already in stock or on order, and books not stocked or on order. She then *passes* them back to the Librarian.

SELECT (cont.)



The Librarian *receives* them, *reads* them, and *passes* the cards for the new items to the relevant subject specialist and *discards* the others. He *receives* back cards for approved items and checks (*verifies*) them for the initials of the subject specialists as confirmation of approval. He then *passes* them to the Order procedure.

The Librarian also *receives* book cards direct from the publishers, form number 2. He *decides* which are likely to be of interest to the College and *enters* the name of the relevant specialist on each of these cards. He *places* the cards in two piles, possible selections and non-selections. He *sorts* the first pile into alphabetic order and *discards* the second pile. He *passes* the possible selections to the library assistant. They are then treated as form number 1 (see above).

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Letters to the Editor

Dear Sir,

REPROGRAPHIC SERVICES IN LIBRARIES

I do not wish to take issue with Mr T. J. Morgan over his paper 'Reprographic Services in Libraries' which appeared in the April issue of *Aslib Proceedings*. However, there are one or two remarks about microfiches, particularly as they relate to the NLL, on which I would like to comment.

(1) It is true that the NLL has recently had installed a step-and-repeat microfiche camera, but this is not capable of producing 250,000 microfiches per year. 25,000 microfiches per annum is the maximum of which it is capable, and with difficult materials such as computer print-out and unpublished reports the rate of output is much lower.

(2) Since this type of camera uses 100 ft rolls of 105 mm. film, the time interval from original document to finished microfiche may be anything up to four days, even if the camera is working continuously. For this reason, the equipment is not suitable for producing microfiches in response to isolated requests and we have no plans for using it in this way.

(3) I feel that Mr Morgan's Figure 3 (p. 147) showing the cost of master microfiches compared to the cost of photocopy and duplicate microfiches is very misleading. The curves for photocopy and for duplicate microfiches agree reasonably well with the NLL's experience including capital write-off, where appropriate, but the costs shown for producing master microfiches seem to be much too low. At the NLL, we have found that the labour cost of filming and checking microfiches (checking always seems to be overlooked in microfiche cost analyses) is nearly 2*d* per frame and can be much higher for material other than plain English text with regular pagination. From the information we have been given, the labour cost for the stripping-up method appears unlikely to be lower.

If film and postage costs are included, the 'NLL Master Microfiche' cost curve would be a straight line beginning at 1*s* 11*d* for a fiche with one page of text, rising through 3*s* 6*d* for 10 pages and reaching 11*s* 2*d* at the point where a trailer fiche is needed (57 pages). However, in order to achieve a true cost comparison it would be necessary to add the cost of capital write-off, which depends very critically on factors such as the total number of fiches produced.

(4) Nevertheless, despite these strictures, I ought to stress that I do agree that the use of microfiches as a duplicating medium can lead to savings, provided that a reasonable number of duplicates is eventually required from each master.

Incidentally, the scope of the Text-Access System of Project INTREX is less ambitious than Mr Morgan indicates. According to the latest Semi-annual Activity Report the present plans envisage about 1600 microfiches in two CARD units, containing the text of about 12,000 journal articles.

Yours faithfully,

R. B. PARSONS

National Lending Library for Science and Technology,
Walton, Boston Spa,
Yorkshire. *13th May 1970*

Dear Sir,

An important element in the cost of making a xerox copy is the number of imperfect copies. Wastage in this library averages 7 per cent of the copies made. It has never been below 5 per cent since records have been kept, and has been as high as 10 per cent. The machine is not under the control of a single operator, which is no doubt the cause of some of the wastage. Then there are the usual difficulties in making good copies from tightly bound volumes. Nevertheless, one is still left wondering whether the reliability of photo-copiers could not be improved. For a library making about 4,000 copies per month, even a 5 per cent wastage rate represents a loss of £50 per annum, or two months rental.

Yours faithfully,

P. G. PEACOCK

Deputy Librarian

University of Stirling,
Stirling,
Scotland,
3rd June 1970

Dear Sir,

FUTURE OF SCIENTIFIC PUBLICATIONS

Herr Segebarth's letter, in the May issue of the *Proceedings* (p. 234–5), and Mr Smailes' paper in the February issue (p. 48–54), do indeed highlight many of today's problems. Redundancy is largely due to those publishers who insist on vying with each other to produce expensive technical books which overlap the field of their rivals.

Libraries, however, have a duty to provide for readers at all levels, and there is still a valid need for the good 'popular' account, provided it is authoritative, for men whose time is precious. If the chairman of the company had just half an hour to brief himself for an unexpected meeting, which would you hand him—a learned journal, or a concise account in the *New Scientist*?

Yours faithfully,

MISS C. PILE

Milk Marketing Board,
Thames Ditton,
Surrey.
2nd June 1970

CURRENT AWARENESS LIST

Recent additions to the Aslib library catalogue are broken down into twelve broad groups, whose coverage is indicated below. These groups are not mutually exclusive but it is hoped that users will find them helpful in scanning for new items of interest.

Note: These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory.

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres; management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

ELIZABETH MACK
Head of Library and
Information Services

CURRENT AWARENESS LIST

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TECHNICAL TRANSLATIONS from Japanese into English. R. A. Scutt, BA, 48 Somerset Avenue, West Wimbledon, London SW20. Tel. WIMbledon 1713 (01-946 1713).

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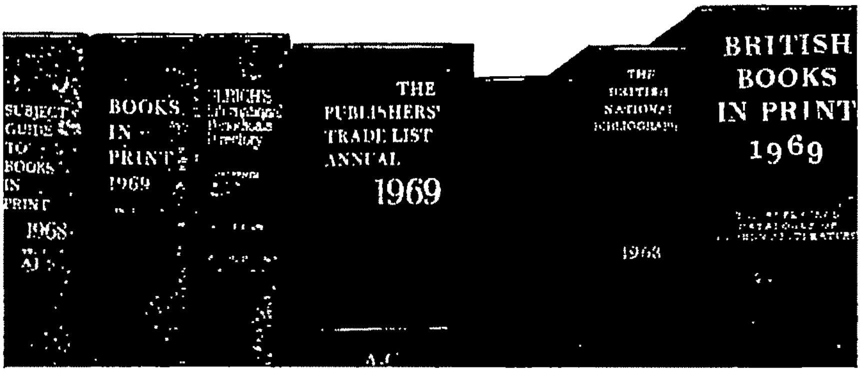
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Volume 22 August 1970 Number 8

ASLIB CALENDAR 1970

September

TUE.8.	Aslib Chemical Group/Technical Translation Group Joint Evening Meeting. 'Technical translations: meeting the need', by Paul H. Scott (BP Research). Aslib. 5 for 5.30 p.m.
THU.10.	Aslib Audio Visual Group wine and cheese/film night. Aslib. 7 for 7.30 p.m.
MON.21–WED.23.	Aslib 44th Annual Conference, University of Aberdeen.

October

THU.1.	Aslib Economics Group Evening Meeting and Lecture. Aslib. 5 for 5.30 p.m.
FRI.2.	Aslib Audio Visual Group one-day meeting with invited members of other audio visual organizations. Aslib.
TUE.20.	Aslib Computer Applications Group Circulation Working Party. One-day symposium: 'Computer-aided systems'.
WED.21.	Aslib/Institute of Information Scientists Joint Evening Meeting. 'OR man looks at IR', by W. T. Bane (IPC New Enterprises). Aslib. 5 for 5.30 p.m.
FRI.23.	Aslib Technical Translation Group Meeting and Lecture by Miss M. T. Ward (SE Gas Board). Aslib. 3 p.m.
MON.26.	Aslib Social Sciences Group Evening Meeting: The organization and provision of social science material in libraries. Aslib. 5 for 5.30 p.m.

November

MON.16–WED.18.	Aslib Audio Visual Group Film Workshop. Aslib.
THU.19.	Aslib Chemical Group. One-day conference. Quaglino's, London.
FRI.20.	Aslib Technical Translation Group Meeting and annual sherry party. 'A linguistic approach to technical translation', by P. P. Newark (Holborn College). Aslib. 3 p.m.
WED.25.	Evening Meeting at Aslib. Procedure for sorting and recording scientists' papers. Speakers: Professor N. Kurti, FRS, Mrs M. Gowing and Miss J. M. Pye. 5 for 5.30 p.m.

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Miss P. I. Edwards, British Museum (Natural History), Cromwell Road, London SW7. 01–589 6323, Ext. 221.	T. Cawley, Rothamsted Experimental Station, Harpenden, Herts. Harpenden (058 27) 4671.	Miss P. Gilbert, British Museum (Natural History), Cromwell Road, London SW7. 01–589 6323. Ext. 291.
Chemical		
Mrs K. Bourton, Head of Information and Library Service, Constructors John Brown Ltd, CJB House, Eastbourne Terrace, London W2.	Mrs J. Mogford, Librarian, BP Chemicals (UK) Ltd, Great Burgh, Epsom, Surrey.	B. Langton, County Technical Librarian, County Library Headquarters, Goldlay Gardens, Chelmsford, Essex. Chelmsford (0245) 51141–2.
Computer Applications		
A. Graham Mackenzie, Librarian, University of Lancaster Library, Bailrigg, Lancaster. Lancaster (0524) 65201	Dr B. J. Enright, The Library, University of Sussex, Falmer, Brighton BN1 9QL, Sussex.	Dr M. F. Lynch, Postgraduate School of Librarianship and Information Science, The University, Sheffield S10 2TN. Sheffield (0742) 78555
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J. L. Jolley, Westbourne House, Westbourne Street, High Wycombe, Bucks	K. P Jones, NRPRA, 56 Tewin Road, Welwyn Garden City, Herts.	Miss V. Horsnell, NIMR (Hampstead), Holly Hill, London NW3. 01–435 2232.
Economics		
G. P. Henderson, Rivendell, 76c The Avenue, Beckenham, Kent. Beckenham (650) 7745.	A. K. Hall, London Chamber of Commerce, 69/75 Cannon Street, London EC4. 01–248 4444.	Miss Helen Moore, National Institute of Economic and Social Research, 2 Dean Trench Street, Smith Square, London SW1. 01–222 7665.

	CHAIRMAN	TREASURER	SECRETARY
Electronics	D. Stanley, Technical Information Officer, Standard Telecommunication Laboratories Ltd, London Road, Harlow, Essex.	G. J. Bontoft, Government Communications HQ, Cheltenham. *Write to*: Craneside, Woolstone, Cheltenham, Glos. Cheltenham (0242) 55321.	Mrs B. Taylor, Plessey Telecommunications Group, Beeston, Nottingham NG9 1LA. Nottingham (0602) 254831.
Engineering	H. Stephens, British Hydromechanics Research Association, Cranfield, Bedford. Cranfield 422	D. Trubshaw, 6 Willow Drive, Countesthorpe, Leics. (*office*: Robert Maxwell and Co. Ltd, Headington Hill Hall, Oxford. Oxford (0865) 64881, messages with E. Street).	Miss E. D. Norman, Burmah Oil Trading Ltd, Burmah House, 57 Chiswell Street, London EC1. 01–628 7088, Ext. 268.
Social Sciences	M. B. Line, Librarian, Bath University of Technology, Northgate House, Upper Borough Walls, Bath, BA1 5AL.	D. R. Streatfield, Confederation of British Industry, 21 Tothill Street, London SW1.	Miss J. M. Harvey, School of Librarianship, Loughborough Technical College, Radmoor, Loughborough, Leics. Loughborough (05093) 5831.
	MEETINGS SECRETARY: Miss A. Sutherland, Tavistock Centre, Belsize Lane, London NW3.		
Technical Translation	Dr J. B. Sykes, UKAEA, Building 465, AERE, Harwell, Didcot, Berks. Abingdon 4141, Ext. 2031.	Miss D. J. Matthews, ICI Ltd, Millbank, London SW1. 01–834 4444.	A. O. Melling, Information Services, Central Electricity Generating Board, Room 524, Sudbury House, 15 Newgate Street, London EC1. 01–248 1202 (mark correspondence 'Personal').
Textile	Miss M. Needham, Textile Council, 3 Alberton Street, Manchester M3 2 WA. 061–832 2402.		P. R. Day, Wool Industries Research Association, Torridon, Headingley Lane, Leeds, LS6 1BW. Leeds (0532) 59071.
Transport	Miss A. M. C. Kahn, MBE, Librarian, Ministry of Transport, St Christopher House, Southwark Street, London SE1.	Mrs J. F. O. Southgate, Cibouri, Oriental Road, Sunninghill, Ascot, Berks.	E. W. Roberts, Board of Trade Marine Library, Room G/7a, Sunley House, 90/93 High Holborn, London WC1. 01–405 6911, Ext. 330.

Audio Visual Group

Much interest has been shown during the last few months in the problems attendant on the growth of multi-media or integrated library collections which include both print and non-print materials. Enquiries about the storage and control of such collections have been made from several sources including Public and Special libraries, Colleges and Institutes of Education, and Universities.

Although many libraries have been coping with collections in one medium, e.g. books, or slides, or film, or gramophone records, the combination of several media in one library or resources centre is a more recent development. Non-print materials are now regarded as extensions of the previously dominant information source, the printed word. It is thought that all information, in no matter what form it appears, should be available for consultation, and the user should be able to select or be guided towards the medium which is most appropriate to his needs and will give him the information he requires.

Several organizations are interested in general problems of audio visual librarianship as well as trying to standardize procedures for the cataloguing and classification of multi media, e.g. the Aslib Audio Visual Group, the Library Association sub-committees which deal with non-print media, the Educational Foundation for Visual Aids, the National Committee for Audio Visual Aids in Education, the British Universities Film Council, NECCTA and the National Council for Educational Technology. Some of these organizations are concerned with technical aspects and problems of production and usage, while others concentrate on the storage, control and retrieval of the information contained in the media.

Co-operation between all these groups would be a useful beginning in order to co-ordinate the efforts being made and to work towards the standardization of procedures and techniques, and prevent duplication of research. As an initial step the Audio Visual Group hopes to try to arrange a round table discussion of representatives from as many of the interested bodies as possible.

Other needs which have become apparent from seminars and workshops held during the past year are:

(1) Standardization in definition and usage of the terminology of audio visual materials. For example there is no consistently used term to describe audio visual aids, or media, or to characterize the audio visual aids department, resources centre, multi-media centre, media library, etc.

(2) Some basic training is necessary for the librarian and users in handling the equipment necessary for audio visual aids, e.g. tape recorders, slide projectors, film projectors, cassette and loop viewers, videotape playback machines.

(3) Storage and control of material also needs attention. In addition to handling the equipment needed to view or playback the audio visual aids, the librarians require advice and training in the proper handling of the materials themselves. Some material requires specialized storage and this in turn will determine the type of filing and control the librarian uses in storing the material and making it available for re-use.

(4) A manual of techniques which will cover technical aspects, control, storage, filing, cataloguing, issue of audio visual aids, and also list definitions,

would be a valuable reference tool for librarians, but this will naturally take time to prepare and publish. At the same time collections are growing and techniques in handling or standards for cataloguing are needed now. If standards and techniques do not appear for some time the task which will face librarians of transferring records from those used as an interim measure to the standard approved schemes will be onerous and the schemes will not achieve a wide application and acceptance. Short courses in handling techniques could help to fill the existing gap and could be used as the basis for the manual. The Aslib Audio Visual Group hopes to organize such a course for new entrants to film librarianship later this year.

(5) A national catalogue of audio visual aids. The value of this particular catalogue is debatable; it would duplicate much work already done, for example, by the British National Film Catalogue or the British Universities Film Council or EFVA, and might include unhelpful information about the smaller items which do not necessarily exist for very long, e.g. slides or wall charts. After discussion and research are completed on this point the catalogue may take the form of several lists, one for each medium.

(6) Until this full catalogue can be compiled in the form decided upon, a directory of libraries and producers of audio visual materials which have material available to outside users is urgently required. The Aslib Audio Visual Group is embarking on a basic list of this type and hopes to establish contact with other organizations who have covered some of the areas already. The directory would give brief details of the name of the organization, address, the type of materials held and/or indexed, the period of time covered by the collections, the subject areas covered and the availability of the materials, that is whether they are for loan, sale or reference.

From Helen P. Harrison,
Assistant Librarian, Open University

OR man looks at IR

At an evening meeting on 21st October, to be held jointly with the Institute of Information Scientists, Mr W. T. Bane, Development Manager of the New Enterprises Department at the International Publishing Corporation, will speak on Operational Research and Information Retrieval.

Operational Research is not easy to define and the first part of the talk will be taken up by illustrating its use of models to solve seemingly complex system problems. The models themselves need not be complicated, and some with a relatively simple structure exhibit behaviour as complex as the system they represent in those aspects that are important to the problem being investigated.

The second part of the talk will deal with part of a wide-ranging commercial investigation into information systems and services. In this investigation, preliminary models were constructed to explain quantitatively the interrelationship of relevance and recall and how discussion with colleagues can give a retrieval performance that is sufficient for many purposes. A further part of the study indicated that the information output rate of the indexing task measured in bits per hour per individual seems to be fairly constant over a wide variety of applications.

The studies were not carried out in depth and were only sufficient for the main purpose of the investigation which was strictly commercial. In consequence, the models are put forward only as first shots at the problem and to illustrate the relevance of Operational Research.

The meeting will be held at Imperial College, London, and will begin at 5.30 p.m. (tea 5 p.m.).

Information Science Discussion Group

The ISDG is a group of people actively engaged in information work who meet at the City University, London EC1, for informal talks and discussions on topics of common interest. The accent is on informality and members are encouraged to air their opinions and problems.

Meetings arranged for the Autumn are as follows:

7th Oct.	Planning and layout of an information department. (Mr M. Howes—Fisons)
28th Oct.	Budgets. (Mr J. Reynolds—Eli Lilly)
25th Nov.	The human factor in information work. (Mr F. Liebesny—Able Language Services Ltd)

Those interested in taking part in discussions may obtain further details from: Mrs M. Siddiqui, c/o CJB (Projects) Ltd, CJB House, Eastbourne Terrace, London W2. Tel. 01–262 8080 (ext. 47).

Course in research methodology

The School of Librarianship, North-Western Polytechnic, will be offering an introductory course in research methodology in librarianship during January 1971. The course will last for a period of one week and is designed to help those either starting a full-time research project or preparing a fellowship thesis.

Further details are available from Mrs P. Layzell Ward, School of Librarianship, North-Western Polytechnic, 207–225 Essex Road, London N1.

Grants from OSTI: a brief guide to applicants

OSTI can normally accept applications for grants to initiate research and development projects in the field of information and library science from the following kinds of institution: (a) Universities and other institutions of higher education; (b) Professional and learned societies and certain other non-profit making bodies; (c) Research associations and similar bodies.

OSTI has recently prepared a brief guide giving advice to independent applicants for grant-aid. The guide outlines the criteria for eligibility for a grant, the procedure for application and the extent to which items of expenditure can be covered by an OSTI grant. It is available on request from the OSTI General Office, Elizabeth House, York Road, London SE1.

Charges for UK MEDLARS service

The MEDLARS service for the retrieval of information in medical literature has been available in Britain since May 1966 experimentally and without charge. Now that the initial period of experiment is ending, charges covering the total cost of computer time will be introduced for UK searches, starting on 1st October 1970.

Once charges are introduced, it will be necessary to ensure a rapid service and this is to be done by purchasing computer facilities on terms which will guarantee a turn-round time of about three weeks. Another change, already introduced, is the splitting of the MEDLARS file into sections, each covering two to three years, so that each section can be processed (and charged) separately.

During 1970 tape sections and charges for UK users will be:

'Pilot File' 1968 to date	£10
'Recent back-file' 1966–7	£8
'Old back-file' 1964–5	£8

For those users who have received approved training in the use of the system (e.g. OSTI-supported MEDLARS Liaison Officers and librarians of some hospitals, medical schools and universities), the pilot searches will cost £6.

Details will be notified to all users of the UK MEDLARS service. Enquiries and applications for searches should be made to the NLL, Walton, Boston Spa, Yorks. LS23 7BQ.

Particle science and technology information service

A new specialized information service in the field of particle technology has recently been made available from Loughborough University through the University's company, Loughborough Consultants Ltd. This service has been established by the University's Department of Chemical Engineering on a non-profit-making basis and is designed to assist with the problems created by the large body of literature available in this field but which is scattered widely in the scientific and technical press.

Each month over a hundred journals are scanned to produce a list of more than 150 titles. Bibliographies on topics of interest can be compiled very quickly and additionally subscribers may borrow from the 6,000 items held by the information service. The information retrieval system uses an optical coincidence method. Subscribers each have a keyword list so that they can either make use of the system themselves or specify the search to be made for them. It is planned to transfer the entire system to a computer with the information store made available in a number of different centres.

Annual subscription to the service is £50 and further information can be obtained from Loughborough Consultants Ltd, University of Technology, Loughborough, Leics.

Standard presentation of library directories

The British Standards Institution have recently published BS 4605 *Presentation of library directories*. This standard describes principles which apply to the presentation, arrangement and indexing of essential and optional information about information centres, documentation centres, archives and data banks, as well as libraries, in library directories of all kinds.

The standard is based on an International Organization for Standardization (ISO) proposal which was prepared by the American National Standards Institute. It also refers to the ISO/IFLA (International Federation of Library Associations) joint proposals, submitted to Unesco, for the character and format of library statistics.

Copies of BS 4605 may be obtained from the BSI Sales Branch, 101–113 Pentonville Road, London N1. Price by post 10*s* (8*s* to subscribers).

Users of Documentation—Abstracts

A 44-page book of abstracts of the papers to be presented at the FID Congress, Buenos Aires, 21st–24th September 1970, has been issued. The theme this year is *Users of Documentation* and includes 38 invited papers in three major sections:

1. Communicating information to users
2. Training of users
3. Tools for users.

Copies of the abstracts are available from the FID Secretariat, 7 Hofweg, The Hague, at 10 Dutch Guilders per copy.

FAO study group on agricultural information

The Director-General of FAO has recently appointed an Advisory Panel to consider the development of an international information system for the agricultural sciences. Sir Thomas Scrivenor, Secretary of the Commonwealth Agricultural Bureaux, has been appointed chairman of the Panel.

To assist the Panel a study group has been set up to report on existing information services in agriculture and to propose possible frameworks for an improved world-wide agricultural information service. Dr H. Coblans, formerly of Aslib, is the UK nominee and chairman of the group. Dr Coblans will keep in contact with other interested bodies, particularly the Agricultural Research Council and the Ministry of Agriculture, Fisheries and Food. The group hopes to submit its report to the Advisory Panel by 15th September 1970.

International Conference on Information Science

An International Conference on Information Science will be held in Israel from 22nd–27th August 1971. Papers will be presented in the following areas: (1) Information analysis and information analysis centres; (2) Retrieval of information; (3) Selection, education, and training of personnel; (4) Publishing and reproduction. English will be the official language.

Social activities will include reception by local officials; visits to educational institutions, libraries, and Israeli homes; and optional sightseeing tours. The proceedings will be published after the conference. The registration fee is $50 per person.

Titles and summaries of papers are due not later than 1st December 1970. For further information, contact: Conference Secretary, ISLIC—Israel Society of Special Libraries and Information Centres, POB 16271, Tel-Aviv.

Management information: statistics and sources

The SINTO (Sheffield Interchange Organization) one-day course held on 23rd June 1970 at the Hallam Tower Hotel, Sheffield, dealt with two major topics: Business statistics and Management information resources. In the first session, Mr F. Cochrane, DGA, FLA, Librarian of the Board of Trade Statistics and Market Intelligence Library, spoke on 'Business statistics: sources for managers and exporters'. He outlined the scope and function of his library and spoke too of the setting up of the Business Statistics Office. He also described the new computerized Export Intelligence Service being offered to industry by the Board of Trade.

Mr J. F. Blagden, ALA, Manager of the Library and Information Services of the British Institute of Management, spoke in the second session on 'Management Information Resources: published and unpublished'. He mentioned the main bibliographical and abstracting aids available on management topics and went on to discuss the various units within the BIM producing and processing management information.

It is hoped to hold further SINTO one-day meetings in the future.

Curriculum of Library Schools

The Graduate School of Library Science and the Division of University Extension of the University of Illinois are holding a conference on the 'Design of the Curriculum of Library Schools' in the Illini Union of the Urbana–Champaign campus from 6th to 9th September 1970. Further details from: Mrs Donna Duff Lenfest, Conference Supervisor, 116 Illini Hall, Champaign, Illinois 61820.

American Society of Indexers

The American Society of Indexers recently elected new officers for 1970–71:

President: Mrs E. F. Steiner-Prag, former editor of the *American Library Directory* and *American Book Trade Directory*, R. R. Bowker Co.
Vice-President: Mrs Susan Pinzow, *The New York Times Index*.
Secretary: Mrs Marlene Hurst, University Microfilms.
Corr. Secretary: Miss Elizabeth Stalcup, freelance indexer.
Treasurer: Herbert Landau, Auerbach Corporation.
Directors: John Fall, Public Affairs Information Service; Dr Theodore C. Hines, Columbia University School of Library Science.

Further information about the American Society of Indexers can be obtained by writing to the Secretary, Mrs Marlene Hurst, University Microfilms, 300 North Zeeb Road, Ann Arbor, Michigan 48106.

LA President

The President of the Library Association for 1971 is to be the City Librarian of Liverpool, Dr George Chandler. At present Chairman of the Association's Executive Committee, Dr Chandler first joined the LA in 1932 and became a Fellow in 1935. He is President of the International Association of Metropolitan City Libraries and, since 1962, has been Director of the Liverpool and District Scientific, Industrial and Research Library Advisory Council. He is also a member of the Library Advisory Council for England, set up by the Department of Education and Science.

People and Places

MR ROY B. STOKES, previously Head of the School of Librarianship at Loughborough University of Technology, recently took up the post of Director of the School of Librarianship, University of British Columbia. Mr Stokes has long been associated with Aslib and was a member of the Aslib Council and of the Education and Publications Committees from 1952 to 1957. He established the School of Librarianship in Loughborough in 1946 and remained as its head until taking up this new appointment. Mr Stokes succeeds Dr Samuel Rothstein, the founder and first director of the UBC School of Librarianship, who will remain at the School as Professor of Librarianship.

DR D. V. ARNOLD, a member of the Council of Aslib almost continuously from 1949, and its Chairman from 1965 to 1967, has accepted an invitation from Mrs L. Vilentchuk of the Centre of Scientific and Technological Information, Tel-Aviv, to lecture to members of a one-year postgraduate course in information science, being held in Tel-Aviv during 1970–71. As announced in the June issue, Mrs Vilentchuk recently visited Aslib to arrange for lecturers for this course to be invited to Israel on Aslib's recommendation.

SIR HAROLD WHITE, who is shortly retiring as Librarian of the National Library of Australia, has been elected as an Honorary Vice-President of the Library Association. He has been librarian of the National Library since 1947 and, from that year until 1967, was also the Commonwealth Parliamentary librarian.

MR W. E. TYLER, MA, FLA, Head of the Department of Librarianship at Strathclyde University, has been appointed to the new Chair of Librarianship there from 1st June 1970. Professor Tyler has been Reader and Head of the Department since 1964, when Strathclyde became the first British University to offer degree courses in Librarianship. This new Chair of Librarianship is only the third of its kind to be created in the UK.

Professor Tyler was formerly a committee member of the Aslib Scottish Branch, during which time he helped to organize Aslib courses and Scottish Branch meetings and conferences at Strathclyde University. He is currently President of the Scottish Library Association.

BRIEF REVIEWS

BODLEIAN LIBRARY. Union list of serials in the science area, Oxford. Stage II (incorporating Stage I). Oxford, the Bodleian Library, 1970. 598 p. £5. (SBN 900177 05 5).

Stage II of the *Union list of serials in the science area, Oxford,* incorporates and amplifies stage I which was published in 1968 and is now out of print.

The layout of stage II is similar to stage I, listing the holdings of forty-nine libraries in the Oxford area, mainly in the scientific fields, plus all current serials coming into the Radcliffe Science Library during Spring 1969. Additionally the most important scientific periodicals held in the RSL, which have ceased publication, are included. As in stage I details of the hours of opening and borrowing facilities of all the libraries contributing to the list are given. However stage II has a much broader coverage than stage I, containing about 15,000 entries, which is approximately 5,000 more than stage I.

Stage II has not incorporated all the serials in the RSL, but only those on the open shelves and a number from the stack. The third and final stage will incorporate all the remaining serials in the stack. Until stage III is published, the Bodleian Library is hoping to produce annual supplements to stage II, listing new accessions to the RSL and scientific departments and also revised entries.

CODLIN, ELLEN M. Cryogenics and refrigeration: a bibliographical guide—2. London, Macdonald, 1970. 263 p. £7. (SBN 356 03063 6). *Macdonald Bibliographical Guides.*

This is the second volume of a comprehensive, although not exhaustive, bibliography covering the literature of the physics and technology of low and very low temperatures for the period 1966–68, with the addition of some early 1969 references. The method of presentation is similar to the first volume in the series, which covers the period 1950–66 with some earlier references, but rearrangements in the classification of the specific subject sections are made in order to account for current trends in research. This second volume contains the cumulative author and subject indexes for both volumes.

CONSTRUCTION INDUSTRY RESEARCH AND INFORMATION ASSOCIATION.
Guide to sources of information. Edited by Barbara J. Smolny. 176 p. £2 4*s* (£1 9*s* to members).
and
Index of technical publications: an A–Z index to publications for the construction industry. 2nd edition. Compiled and designed by Dargan Bullivant Associates. 179 p. £2 9*s* (£1 12*s* to members).
London, CIRIA, 1970. £3 14*s* the pair (£2 12*s* to members).

Two volumes from an organization which has not received the support that these publications suggest it should have had. The first is based on a list compiled (but not published) by the Ministry of Public Building and Works. Each entry gives the full name and address of 550 organizations together with such details as library services and publications. The second, compiled and designed by Dargan Bullivant Associates, now contains approximately 4,000 publications from 175 sources. The first publication lists its organizations alphabetically and has a subject index, and the second is arranged in the form of an alphabetic subject index. It would be handier if the two were combined into one sequence, if there are no organizational difficulties, but in any case both are useful works of reference.

EUROPEAN TRANSLATIONS CENTRE. Translations Journals: list of periodicals translated cover-to-cover, abstracted publications and periodicals containing selected articles. Compiled by A. S. de Groot-de Rook. Delft, ETC. 50 p. $2.

This is a combined bibliographical list and union catalogue intended as a guide to non-western scientific and technical journals both current and discontinued, of which complete, selected or abstracted translations exist in western languages. Entries appear alphabetically under the title of the journal in its original language and include the translated title, bibliographic details, periodicity, price, translation source and availability. There are separate indexes of publishing houses and holding libraries.

There is no date on the review copy; it appears, however, to be taken from the annual cumulated volume of *World Index*, 1969, also published by the ETC. It is now apparently intended that *Translations Journals* shall be published separately at a price of $2.00, while continuing to form an integral part of each annual cumulation of *World Index*. The separate edition of *Translations Journals* will be of limited use, however, without a clear indication of date and regularity of appearance.

FOOD AND AGRICULTURE ORGANIZATION of the United Nations (Terminology and Reference Section). Dictionaries and vocabularies in the Terminology Reference Library, 1966–1970. Rome, FAO, 1970. 101 p. Unpriced.

This bibliography contains details of 560 dictionaries and vocabularies received in the FAO Library during the period 1966–70. The list is divided into three sections: technical dictionaries, and dictionaries published by FAO (both these sections are arranged by subject) and language dictionaries and vocabularies arranged by language. All sections include both monolingual and multilingual publications. The entries give author, title, place and name of publisher, date, and the UDC number used in the FAO Library.

There is an author index, and subject indexes in English, French, Spanish and German. A new feature in this edition is an index to the languages included in each dictionary. Copies may be requested from the Terminology and Reference Section, FAO, Via delle Terme di Caracalla, Rome.

KEMP, D. A. Astronomy and astrophysics: a bibliographical guide. London, Macdonald; Hamden (Conn.), Archon, 1970. 584 p. £10. (British SBN 356 03011 3; American SBN 208 01035 1). *Macdonald Bibliographical Guides.*

This book provides a critical and selective guide to the literature of astronomy and astrophysics, and related subjects. It lists important books and review articles, the major papers in periodicals and the report literature which are sources of theories and/or data, and non-technical accounts.

The first section of the 75 sections of the guide lists more general reference bibliographies and special astronomical sources of information such as star catalogues. Numbered entries are arranged chronologically in the remaining specialized subject sections and practically all the items have been seen. An additional feature is a useful list of abbreviations and acronyms of frequently used and obscure astronomical literature

PRIESTLY, BARBARA, *comp.* British qualifications: a comprehensive guide to educational, technical, professional and academic qualifications in Britain. 2nd edition. London, Kogan Page, 1970. 1278 p. 80*s.* (SBN 85038 050 2).

This is the second edition of the book first published in 1966. It has been revised to cover the many changes which have taken place since the appearance of the first edition, in qualifications themselves and in the organization of the institutions awarding them, so that almost every entry has been altered. The layout, however, remains the same: there is an explanatory index of abbreviations and designatory letters which also refers to their position in the text; and the main section, arranged by trade or profession, describes qualifications in each subject. The other main section deals with all the qualifications awarded by universities. The contents list is full, the general index is extremely detailed, and there is also an index of advertisers. The brevity of the entries may lead, in a few cases, to slight misconceptions, but for overall reference purposes this is a highly useful volume.

International Council of Scientific Unions

The ICSU Abstracting Board has announced the publication of two new reports. The annual report, *Survey of the activities of the ICSU scientific unions, special and scientific committees and commissions of ICSU in the field of scientific information during the year 1969,* lists more than 170 commissions or committees, gives general information on each, and describes its activities in 1969. It costs $12.00.

Also published is the *Tentative list of publications of ICSU scientific unions, special and scientific committees and commissions of ICSU, year 1969, and corrections and additions to the 1968 list* (Price $5). Both the Survey and the List are available from the ICSU AB Secretariat, 17 rue Mirabeau, Paris 16e.

INTERGOVERNMENTAL PLANS AND ACHIEVEMENTS: OECD AND OTHER INTERNATIONAL BODIES

P. J. JUDGE

Head of Section for Scientific and Technical Information,
Directorate for Scientific Affairs, OECD

Paper presented at a One-Day Conference on International Developments in Scientific Information Services, Royal Society, 10th June 1970

Introduction—international working starts at home

THE TITLE that was printed in the programme—'OECD and Unesco'—which took me a little by surprise, is at the same time too broad and too constricting. Too broad, because one can say a great deal about intergovernmental planning and co-operation without ever mentioning an international organization. Too broad also, perhaps, because I have been involved directly only in the OECD programmes and so can only talk about OECD at first hand. Too constricting, because if one introduces international organizations at all there is no justification for stopping at those two: there are a great many inter- and non-governmental bodies interested in information[1] and governments work with all of them.

I propose therefore to focus mainly on activities within the areas of information for which the OECD Member governments have assumed responsibility, and which they have undertaken within the forum of the OECD—activities more often at the policy level than the operational level—and to give examples of international working and planning. This international working may be bilateral, or multilateral (examples of this are the kind of regional collaboration at the level of NORDFORSK, the Common Market, ESRO or OECD) or, at least potentially, world-wide as is the case with UNISIST, INIS or other co-operative schemes started under the aegis of the United Nations agencies.

At whatever scale the intergovernmental working takes place, it is commonly more than just collaboration between a number of agencies acting mainly in their own interest, although important examples of such interagency activity exist (e.g. the International Road Research Documentation Service, exchanging published and unpublished literature between laboratories in fifteen OECD Member countries). In many cases government is acting as promoter, co-ordinator or agent for activities in the country which may be widely dispersed, and which may be all or partially outside the public sector.

It can be seen from this that a major problem in intergovernmental working is to ensure that the governmental negotiators can effectively represent the variety of national initiatives on behalf of which they are speaking, and that they can return from the international conference table and initiate *action* at the various scattered points in the country where this may be required. A part of this action may include setting up a national mechanism so that the results of the international agreement, whatever they may be, are exploited and used effectively throughout the country.

These considerations are, of course, valid whether it is government or any other national spokesmen (e.g. from scientific societies or engineering associations) concerned with negotiating international agreements. Hence the truism that *international working starts at home*: without efficient co-ordination at the national level, it is most unlikely that effective international results can follow.

National information policies

OECD's interest in developing governmental concern *at policy level* with scientific and technical information matters arose from its work in science policy during the period 1960–64. It was appreciated that the OECD objectives in economic and social development were linked closely to the potentials inherent in advances in science and technology, coupled with the massive investments by governments and industries in generating new knowledge. The realization of these potentials, and the wise management of these investments in R & D, depend on the effective harnessing of this new knowledge.

Even five years ago it was noted that the growth of governmental support had altered the entire complexion and motivation of scientific and technological pursuits. Research and development has become a national enterprise with far-reaching implications for national security, prestige, and economic well-being. It is not surprising, in view of this phenomenal growth, that research and development is encountering serious communications problems, and the information systems for science and technology show signs of over-load.

The tremendous increase in national investments in science and technology created demands on governments to make the R & D more productive through rapid dissemination of such results, and to provide research managers and planners with adequate information to improve the choice and direction of research.

Considerations of this kind led at the beginning of 1965 to setting up in OECD a 'Scientific and Technical Information Policy Group' with the purpose of bringing together the government officials in its Member countries who had responsibilities at policy level for national programmes in scientific and technical information. Its terms of reference were to:

- —draw increased national attention to scientific and technical information and the need to allocate sufficient resources for its support;
- —identify mechanisms and guidelines for establishing national policies regarding information systems for science and technology;
- —study ways to strengthen national organization for dealing with mounting and complex problems of scientific and technological information, including the strengthening of non-governmental communication systems;
- —exchange national experiences with different techniques and mechanisms for more effective handling of scientific and technical information. This could lead to studies of the cost/benefit relationships of information systems, and to selected country reviews and confrontations on national scientific and technical information systems;
- —identify specific problems for co-operative action, including development of international arrangements for co-operative activities among OECD countries;
- —guide formulation of national policies with regard to the various international organizations concerned with information systems for science and technology.

Inevitably, the Information Policy Group (the 'IPG') began work slowly: in many countries it was difficult to find government officials with the kind of responsibilities envisaged in the terms of reference. However, the OECD Third Ministerial Meeting on Science in March 1968 gave an opportunity to discuss the first findings of the Group in the context of science policy more generally. As a result, and in the light of the 'General report on Information Systems and Policies'[2], the Ministers recommended that:

> —at the national level: Member countries should take appropriate steps within their respective governments to establish in each case a single high-level focus concerned with all national activity in the field of scientific and technical information;
>
> —at the international level the OECD should continue to follow the progress of information techniques, identify possible aims in regard to the development of such techniques, evaluate the means required to achieve these aims, indicate the resources and means required and the co-ordination and co-operation that might be appropriate, and develop its own means for furthering co-operation and agreement.

The 'national focus' for scientific and technical information

This Ministerial recommendation seems to have facilitated in many countries the task of setting up somewhere, in or close to policy levels in government, an office or co-ordinating committee with clear responsibilities for co-ordination and development of national scientific and technical information activities. Table 1 gives a summary of the location of these policy bodies for the main OECD countries. Although in some countries there are two or more bodies which share responsibilities for information policy, in most of these cases formal or informal arrangements have come into being to ensure more efficient co-ordination.

Table 1 also shows that national focuses in different countries may be at very different levels in their respective hierarchies: in some, the responsibilities for co-ordination have been delegated to documentation societies or *ad hoc* committees on an interim basis. In other countries, the co-ordinating mechanisms may only apply to one part of the total field of information: for example in the United States, COSATI is mainly concerned with co-ordinating the information activities of the federal agencies; the other two main areas of activity, the scientific and engineering societies and the for-profit 'information industry', are currently concerned with developing their own co-ordinating mechanisms (consequent upon the SATCOM Report,[3] and upon the setting up of the Information Industry Association a couple of years ago).

What is significant here is that the *need* for an effective information policy is now fully accepted by most countries, which was not the case five years ago. After all, no one would expect that these national focuses would look alike in different countries: the kind of authority and the ways of working are quite different in the various national administrations. In many cases they have mainly advisory powers and their authority is limited to giving subsidies or grants for research, promotion, development or pilot operations. What will be important in the future is that the bodies concerned should have the confidence of the documentalists and information specialists whose activities they are intended to strengthen and extend.

TABLE 1: *Main Information Policy Bodies of OECD Member countries*

AUSTRIA	c*	Federal Chancellery (Section of Scientific Construction)
	e	Ministry for Building and Technology—through the Austrian Society for Documentation
BELGIUM	b	National Science Policy Council
	e	Royal Library
CANADA	b	National Research Council
DENMARK	b	(Being set up, on the initiative of the Danish Science Advisory Council)
FINLAND	d	TINFO (Finnish Council for Scientific and Technical Information)
FRANCE	e	CNRS (National Scientific Research Centre)
	b	DGRST (General Delegation for Scientific and Technological Research) National Documentation Committee
GERMANY	d	Federal Ministry for Education and Science
	e	Institute for Information
IRELAND	d	(Being set up, on the initiative of the National Science Council and the Institute for Industrial Research and Standards)
ITALY	b	National Research Council
	g	National Institute for Information
JAPAN	d	Science and Technology Agency
NETHERLANDS	d	Organization for Scientific and Technical Information (based on NIDER)
NORWAY	b	Information Policy Committee of NTNF (Norwegian Council for Scientific and Industrial Research)
SPAIN	b	(National Council for Scientific and Technical Information, in planning)
SWEDEN	d	SINFDOK (Swedish Council for Scientific and Technical Information and Documentation)
SWITZERLAND	f	Federal Polytechnic, Zurich Expert Commission for Documentation
UNITED KINGDOM	d	Office for Scientific and Technical Information (Department of Education and Science)
	d	Ministry of Technology
UNITED STATES	b	COSATI (Committee on Scientific and Technical Information, in the Office of Science and Technology)
YUGOSLAVIA	d	Committee for Scientific and Technical Information and Documentation of the Federal Council for the Co-ordination of Scientific Activities.

* Letters b to g refer to hierarchical levels in the administration.

The role and responsibilities of government in STI.

In 1968, shortly after the Ministerial Meeting on Science, analysis of the activities of the national focuses then existing led to the outline list of the functions of a national focus shown in Table 2. This list has been used as a basis for the terms of reference of a number of the national focuses which have been set up since.

However, recent thinking in the Information Policy Group is that this list is too narrowly conceived, in terms of scientific information for the scientist and engineer. The SATCOM Report drew attention to the different kinds of 'user need-group', emphasizing the wide variety of kinds of information user with greatly differing needs.

One special category of users includes the decision-makers and policy-makers in government. The IPG is now satisfied that a policy for information should include the provision of 'information for policy'—the scientific and technical information needed by government officials concerned with a wide variety of problems, as part of the input to the formulation of policy.

The IPG would also now place much greater emphasis on the development of interdisciplinary working; on the development of information services in the social sciences, and the integration of these into multidisciplinary systems including information and data from the natural sciences; and on the education and training aspects, looking to the provision of new kinds of information specialists to cope, in a 'user-oriented' way, with the increasing complexity of the information problems which are arising and the increasing sophistication of the techniques becoming available to resolve them.

TABLE 2: *Functions of the 'national focus' for information activities (July 1968)*

1 To make all types of relevant literature (and data) available to qualified users (through libraries, document centres, translation services, directories, etc.)
2 Training information specialists and users in traditional and new ways of information
3 Developing national systems of discipline-based information and data, or co-operating in international systems (including evaluation and forecast of requirements)
4 Improving specialized services of information and data by promotion and development, pilot operation, etc., nationally or in international co-operation
5 Efficiency studies of library operations, and training in new techniques
6 Establishing computer facilities where necessary, and contributing to standards for compatible operation
7 Building up information 'repackaging' and liaison services to specialized users (this includes technical information services for small industry and development of information analysis centres)
8 Promoting and co-ordinating basic R & D in information theory and practice
9 Determining objectives and resources for functions 1–8, in the context of national science and other relevant policies; allocating resources between these various types of activity
10 Co-ordinating national participation in international activities.

If I have talked at length about the development of national planning and policy mechanisms in this field, it is because I believe that the development of these mechanisms is basic to future intergovernmental working. As you will see from Table 2, international activities are specifically mentioned in relation to functions 3, 4 and 10: the IPG has also examined policy issues in the areas of 2, 7 and 9.

Plans and achievements

I wish to talk now about five areas of action, selected from recent and current work in the OECD programmes.

1. *Development of International Co-operation in Information Systems*

During the last three years, the OECD Information Policy Group has discussed possible multilateral co-operation in a number of systems:

—a proposal had been made by the National Library of Medicine that a consortium of European countries might exploit the MEDLARS tapes, setting up national search formulation centres but in the first place using tape processing centres already existing in the United Kingdom and Sweden;

—the American Chemical Society offered particularly generous terms to facilitate access for

national chemical information centres to the Chemical Abstracts Services tapes, and to provide training facilities at Columbus;
—at an early stage in the development of the INSPEC system, experimental tapes were offered to Member countries for field trial;
—the German system, International Chemical Documentation, was similarly offered to Member countries for field trial.

In the event, none of these proposals resulted directly in multilateral international information systems. The reasons differed in detail from system to system, but arose in large part from the inescapable situation that not all countries were ready to begin experiments, or operations, at the same time because of their different national organizations and levels of technological development in the various fields concerned. For this reason, the pattern of progress in these fields has tended to be that intensive multilateral discussion has given rise to a series of bilateral agreements, each bilateral agreement being tailored to the particular needs of the country concerned.

The advantages of the preliminary multilateral discussions, however, have been seen in a number of instances. One example, in relation to MEDLARS, was the development of links between the UK and Swedish centres and other European countries which led to a considerable effort in training search formulators at Boston Spa and Stockholm, to supplement the limited training possibilities then available in the United States.

The OECD Chemical Information Panel provides another example: a special Sub-Group consisting of the Operators of Chemical Information Systems (CHEOPS) which met to exchange technical know-how, discuss practical problems of operating these systems, and to provide a 'users' club' to develop a common voice with which to confront, when necessary, the Chemical Abstracts System. CHEOPS has recently broadened its field of interest to become the 'European Association of Scientific Information and Dissemination Centres' (EUSIDIC), and is now operating quite independently of the OECD.

With a broader international framework, other kinds of agreement have been reached between countries: for example, the arrangements between Denmark and the Netherlands with regard to their common use of chemical information processing software, and the agreements between the Scandinavian countries to pool efforts in using some tape services so that not every country needs to process all the systems itself in order to have access to them.

The six countries of the Common Market have been discussing the initiatives which they can take in common: the fields that they have selected for priority attention are metallurgy, agriculture and bio-medicine. Systems work is already going on in Luxemburg, in the development of an information system for metallurgy, using some of the software developed for the EURATOM system and, of course, taking up contacts with Metals Abstracts in London. The development of an information service in the agricultural sciences is also being discussed in the broader forum of the FAO, looking to a possible integration of an eventual Common Market system into a world-wide network.

I imagine that Dr Barrett will be talking in more detail about some of these systems—and particularly INIS—so that there is no need for me to try to give a complete listing (see p. 386 et seq. below).

2. *Compatibility of information systems*

This was one of the problems identified by the Ministers of Science as a key field for further OECD attention. In fact, discussions in the Systems Panel of the Information Policy Group showed that the technical problems of hardware and software incompatibility were not factors limiting systems interconnection, and the development of standards at the interfaces between systems was already well advanced, based on groundwork like the MARC II format, in places like the USASI Z 39 Committee, the ISO TC 46 and 97 Committees, and in UNISIST—about which Mr Smith will no doubt be saying more.

However, there are intellectual and economic problems in transferring information from one system to another which may be as effective barriers as the technical problems, and the Member governments of OECD will be exploring some of these problems further in the immediate future. OECD is not primarily a standardization body, and is delighted to leave the task of standardization to those organizations best suited to do it—provided that those organizations are tackling the priority issues with the sense of urgency that is called for. In this particular case, liaison with ISO is facilitated, since the Swedish Chairman of ISO TC 46 is also the Chairman of the OECD Systems Panel.

3. *Information Analysis Centres*

An Information Analysis Centre is a unit concerned with a well-defined area of science or technology, which gathers together the world literature and other information sources in that area, organizes, indexes and stores it. Then, using this as raw material, the *subject specialists* in the unit select relevant portions for critical examination and evaluation and prepare critical reviews, data compilations or other outputs based on sophisticated intellectual analysis. It is clear that only highly qualified subject specialists can do this work, which takes the task of documentation and information a step further forward; indeed, some people see this as one of the most promising lines now available towards solving some of our more pressing information problems.

This is not to say that IAC's are a new concept—industrial information centres have been doing this kind of thing for years, and the 'specialized information centres' set up in this country and elsewhere (partly as a response to the Weinberg Report) have just this role. It is disturbing to contrast the several hundred of these centres now existing in the United States with the handful known to be operating in Europe, and the feeling is growing that more experimentation is needed here on this side of the Atlantic.

International co-operation in this field has been so far largely restricted to the network of critically evaluated numerical Data Centres set up under the CODATA programme of ICSU. Although ICSU is a non-governmental organization, and the national committees which have been set up in many countries to co-ordinate the CODATA programme nationally are frequently the responsibility of national academies of science, governments have been concerned in this programme since its outset.

In November 1969, the Information Policy Group held a discussion, in the form of a 'confrontation', on the topic of Information Analysis Centres (IACs): background papers describing national policies in relation to IACs were provided by the United States, the United Kingdom, Germany and Sweden, and a debate was held on the issues raised. This confrontation has led to increased governmental interest in IACs in a number of countries. One of the conclusions of the debate was that given the high cost of the intellectual effort applied to the tasks of information analysis, evaluation and review, such centres are likely to be economic only if undertaken in international co-operation. This governmental interest is therefore likely to lead to greater international activity and experimentation with analysis centres in the future.

4. *Education and training*

As I mentioned earlier, the availability of suitable personnel is a limiting factor in the development of information systems in many countries. This is a field in which FID has been active in the past, and I have no doubt that Dr Sviridov is intending to say something about this.* There are, however, many interactions between the government policies for developing appropriate staff for its information systems and, on the one hand, its policies for education and training, and on the other its personnel policies in government administration more generally.

For these reasons, OECD has recently examined, again in the form of a confrontation, the policies of some of its Member countries in regard to the training of information specialists. It is proposed that further work in OECD will try to develop a common policy among its Member countries to ensure a salary, conditions of employment, and 'image' which can attract the best candidates into the challenging opportunities opening in the future.

5. *Economic aspects*

For some years, the IPG has been trying, through its Economics of Information Panel, to develop a commonly agreed set of definitions and methodology for measuring the resources devoted by its different member countries to scientific and technical information. It has also been exploring, through the generosity of the United Kingdom authorities, means of measuring cost, effectiveness and cost/effectiveness of different kinds of information systems or service.

Information such as this is basic to the allocation of resources in the implementation of an active governmental information policy. Progress is being made, and it is hoped that the development of the quantitative bases for information policies will proceed in step with the development of these policies.

A study is now starting at an international level on the criteria for establishing charges for information services. At the present time, declared policies in different countries range at one extreme from the provision of all information services free of charge (in line with public library policy) to, at the other extreme, recovery of all operating costs at the full economic rate. It is clear that as information systems increasingly become international in their scope and operation, a common understanding of the criteria and implications of setting charges of different kinds for different services becomes vital. While a *single* international pricing policy, at least for the governmental information services, is unlikely to be feasible even in so homogeneous a group of countries as that represented by the OECD nations, it is essential that some degree of compatible tarification is developed.

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* See p. 377 et seq. below.

The present and the future

It has been said that one of the most distressing 'gaps' is the one between the enormous mass of knowledge in the world, which is being added to at a dizzy and still accelerating rate, and the relative ignorance of each individual, whose intellectual power to absorb new information has so far been only slightly increased by new technology. Modern information systems and services are trying to improve the access of the individual to the world's reservoirs of knowledge.

This is a dynamic situation, and I hope that the picture I have presented, of a few of the 'intergovernmental plans and achievements', is a sufficiently dynamic one. I am, however, concerned lest the contrast between this morning's session —'the present'—and this afternoon's—'the future'—gives the impression that what is happening now is old-fashioned, dyed-in-the-wool traditionalism compared with the exciting new technological break-throughs in store. This is just not true.

What has been evolved in recent years, nationally and internationally, and what is beginning to move forward now, has developed the necessary co-ordinating and management mechanisms to enable the future to happen. The whole field of information and communication is in ferment; but progress in it must be oriented towards common goals, and managed along compatible lines. The OECD member governments, acting in concert, are trying to provide the framework by which information systems can be brought into being and operated most effectively. This work at the national and international level is already helping to build tomorrow's world.

NOTES AND REFERENCES

1 The OECD booklet *Information activities of international organizations* deals with the current programmes of 35 inter- and non-governmental bodies interested in information (OECD, *gratis*).

2 OECD Document CMS (68) 18.
See also *OECD Observer* No. 33/April 1968, which summarizes all the reports submitted to this Ministerial Meeting, and also gives the Ministers' conclusions and recommendations.

3 *Scientific and technical communication—a pressing national problem and recommendations for its solution*. Washington, National Academy of Sciences, 1969 (Report of the Committee on Scientific and Technical Communication—SATCOM—of the National Academies of Sciences and Engineering)

INTERNATIONAL CO-OPERATION AMONG INFORMATION SPECIALISTS: THE WORK OF FID

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Paper presented at a One-Day Conference on International Developments in Scientific Information Services, Royal Society, 10th June 1970

RAPID progress of science and technology and its growing influence on all aspects of life of the modern society are characteristic features of our time. Well-functioning and effective information services are a pre-requisite for any further development (from preparing a small experiment in a research laboratory to decision-making by a governmental agency).

This very brief statement indicates the complex nature of tasks facing scientific and technical information services in various countries.

The situation is even more complex on the international level, where all problems are magnified by usual amenities required for international co-operation. This makes it imperative to have an efficient truly international forum enabling information experts from many countries to exchange their ideas and promoting effective professional co-operation all over the world.

The International Federation for Documentation (FID), the oldest (created in 1895) and the biggest international non-governmental organization in the information field, has become such a forum, giving expert advice to many national and international organizations, as well as to numerous individual documentalists. Changing trends and methods in information work have resulted in various modifications of the FID's programme. The main aims of the Federation at present are as follows:

—co-ordination of information activities of international and national organizations, as well as of individuals;
—elaboration and studies of basic problems of scientific and technical information;
—promotion of the training of documentalists and users of information;
—co-ordination of the revision and expansion of the Universal Decimal Classification (UDC);
—international standardization of classification terms;
—studies and evaluation of forms of communication used in providing technical information to industry;
—studies of theoretical and operational aspects of machine techniques and systems;
—survey and evaluation of linguistic and related studies with real or potential applications to information processing;
—assistance to developing countries in creating their national information services, etc.

This indicates that our Federation is no longer only a UDC-promoting organization and that the UDC work is only one of the major areas covered by FID activities, although a very important one.

The FID is carrying out these and other tasks in close and effective co-operation with about fifty other international organizations active in the field of scientific and technical information and documentation.

Special attention is paid by us to our co-operation with Unesco where the FID has consultative status 'A'. We have close working contacts with the Department of Documentation, Libraries and Archives and the Department of Application of Science. Our co-operation with Unesco is carried out through specific projects, undertaken by the FID under Unesco contracts, and also by mutual attendance at the relevant meetings.

The following projects have been recently completed under Unesco contracts:

—manuscripts for the 2-volume set of *Abstracting Services in Science, Technology, Medicine, Agriculture, Social Sciences and Humanities* (published by the FID General Secretariat);

—preparation and publication (also by the FID General Secretariat) of the *10-Year Supplement to Abridged UDC Editions, 1958-1968*;

—manuscript for the *Guide for an Introductory Course on Documentation*, prepared by VINITI, Moscow;

—manuscript for the *Guide for the Training of Documentation Users in Various Fields of Learning*, prepared by CIINTE, Warsaw;

—manuscript for the *Manual on the Application of Mechanization and Data Processing to Documentation and Library Work*, prepared jointly by VINITI, Moscow, and Bochum University Library, Germany,

—manuscript for the *Study on the International Standardization of Library and Documentation Techniques*, prepared by the Hungarian National Committee for FID.

The above-mentioned contracts were for the total amount of 74,500 Dutch guilders. One more project, also under a Unesco contract (21,600 Dutch guilders): *Study on National Structures for Documentation and Library Services in Countries with Different Levels of Development* is being carried out by FID/DC.

Our Federation is participating in the activities of the International Advisory Committee on Documentation, Libraries and Archives, as well as in the work of the ICSU–Unesco Central Committee to study the feasibility of a world science information system.

We have consultative relations also with the UN Economic and Social Council (ECOSOC), UN Food and Agricultural Organization (FAO), International Atomic Energy Agency (IAEA), World Meteorological Organization (WMO), Council of Europe, International Organization for Standardization (ISO), International Council for Building Research, Studies and Documentation (CIB) and International Telecommunication Union (ITU).

Another form of FID's co-operation with other international organizations is membership in those organizations. Last October ICSU elected FID as its first Scientific Affiliate. In April this year FID became one of the first international organizations to be granted consultative status by UNIDO. Our Federation is a member of the International Federation of Library Associations (IFLA), International Council for Reprography (ICR), Committee for International Co-operation in Information Retrieval among Examining Patent Offices (ICIREPAT), International Committee for Social Sciences Documentation (ICSSD), International Council of Museums (ICOM) and Union of International Associations (UIA).

The FID's Statutes allow associate membership to other international organizations active in the field of information and documentation. The Commonwealth Agricultural Bureaux (CAB) and Commission of European Communities are at present Associate Members of the FID.

Still another form of FID's international contacts is represented by joint committees of the FID and other international organizations (CIB and International Association of Agricultural Librarians and Documentalists—IAALD).

The FID has close working relations with a number of international organizations although there are no formal connections between them. Here I would like to mention CODATA, ICSU Abstracting Board, IFIP, International Council on Archives, Asian Productivity Organization, Comecon, OECD, etc.

Participation in international meetings is one of the most effective ways of international co-operation. This form of activity has been actively pursued and the FID has been represented at almost all relevant international meetings all over the world.

Finally, the picture of the international contacts of our Federation would not be complete without a word about our Members and Affiliates. The FID has 51 National Members and about 300 Affiliates. Among the National Members I would like to mention Aslib, National Academy of Sciences in the USA, National Research Council of Canada, All Union Institute of Scientific and Technical Information of the USSR Academy of Sciences (VINITI) and many other major information centres of the world.

Among the Affiliates there are such organizations as the Central Technical Information Unit of Imperial Chemical Industries Ltd (London), National Computing Centre (Manchester), Library Association of Australia, National Library of Canada, American Society for Information Science, Institute for Scientific Information (Philadelphia), Yale University Library and many others.

It gives me great pleasure to say that the British Affiliates are playing an active role in the activities of our Federation. I would like to mention them (in addition to two organizations mentioned above). They are as follows: Mr A. E. Cawkell, Dr P. S. Davison, Miss Ph. I. Edwards, Mr S. P. Foundos, Mr A. P. Harvey, Miss Ella V. Marshall, Mr H. J. Norris and Mr John White.

After this general outline of a vast range of international contacts of the FID, I shall try to describe major international projects undertaken or planned by our Federation this year.

Research on the theoretical basis of information

The Study Committee on Research on the Theoretical Basis of Information (FID/RI) is chaired by Professor A. I. Mikhailov, Director of VINITI, Moscow.

The Committee members represent Belgium, Czechoslovakia, Commission of European Communities, France, German Democratic Republic, Italy, Japan, Netherlands, Norway, Rumania, UK, USA and USSR.

Among the major projects of the Committee for 1970 are:

—studies of world-wide volume and structure of information to be processed;
—preparation and publication in 1970 of the second volume of collection of original articles on the theory of scientific information, *The Theory of Information Retrieval Systems*;
—preparation of the third volume of the same series, *Studies of Information Requirements and Needs of Users*.

Classification research

The Study Committee on Classification Research (FID/CR) is chaired by Mr

R. Mølgaard Hansen, Director of the Dansk Central for Dokumentation, Copenhagen.

The Committee has members from Austria, Belgium, Brazil, Czechoslovakia, Denmark, Ethiopia, France, Germany, India, Israel, Japan, Netherlands, Poland, Sweden, UK and USA.

The Committee maintains close working contacts with classification research groups in Czechoslovakia, Denmark, France, Germany, India, Japan, Netherlands, Poland, Sweden, UK and USA.

The Committee's projects include:

—standardization of classification terms. The project is carried out in close co-operation with ISO/TC 46;

—co-operation with a Working Group of the Food Science and Technology Abstracts (FSTA) of the International Food Information Service (IFIS) on principles concerning a multilingual Food Science Thesaurus;

—promotion of studies of specific subjects within the general topic 'Contribution of classification to the requirements of national and international exchange of bibliographic information in machine-readable form';

—preparations for the 3rd International Classification Conference, to be held probably in 1971;

—co-operation with FID/CCC, FID/OM and FID/TM in the preparation of the 2nd International Seminar on 'UDC in Mechanized Information Retrieval Systems' held in Frankfurt-am-Main from 1st to 5th June 1970

Universal Decimal Classification

The Central Classification Committee (FID/CCC) is chaired by Mr A. van der Laan, Director of the Nederlands Instituut voor Informatie, Documentatie en Registratuur (NIDER), The Hague.

The Committee members come from Argentina, Belgium, Brazil, Czechoslovakia, France, Germany, Hungary, Japan, Netherlands, Poland, Portugal, Spain, Sweden (also representing Finland), UK, USA, USSR and Yugoslavia.

In 1970, as part of its new, forward-looking UDC development programme, FID/CCC is seeking to implement its mechanization studies; to promote the role of the UDC as an international unifying code for information systems or networks using otherwise incompatible schemes; and to study the feasibility of concordances with selected special-subject classifications and, above all, with such major subject-lists as the Thesaurus of Engineering and Scientific Terms (TEST) and the Aligned List of Descriptors (ALD). At the same time, the Committee will encourage the experimental application of the newly introduced Relator scheme (Perreault) during the next five years and give more attention to the planned redevelopment of the vacant class 4.

A substantial allocation by the FID Council (18,000 Dutch guilders) for a trial one-year period will pay for experts to complete in 1970 a limited number of priority development projects in the following fields:

03/04	Documents, documentation and information science
3	Social sciences
4A	Automation
53S	Solid state physics (completely new schedule)
57M	Molecular and cellular biology, cytogenetics, etc.
61	Medical sciences

	(a) to complete major revision project for 612 and 616
	(b) to develop alternative improved notation for -0 . . .
63	Agriculture and livestock
	(a) Agricultural economics 631.1 in liaison with FID/C 3
	(b) Veterinary science (619 or 636) in liaison with FID/C 61
-03	Materials facet (Gen. auxiliaries, Table I.k.)
-05	Persons facet (Gen. auxiliaries, Table I.k.).

Several other important UDC revision projects are expected to be well advanced or completed, without FID funding, during 1970, e.g.

15	Psychology (or possibly in the vacant class 4)
33	Economics, 34 Law, and new schedule for Sociology (by FID/C 3)
51	Mathematics (total VINITI revision)
52	Astronomy (VINITI revision)
53	Physics—several sectors (as well as Solid state, see above) (FID/C 53)
54+66	Chemistry and chemical technology—further sections (FID/C 54+66)
55	Earth sciences, especially economic geology and geomorphology (FID/C 55)
62-1/-9	Engineering details (new FID/C 62-1/-9 in formation)
629	Transport vehicles, esp. Railways and Ships (FID/C 629)
69+624	Building and construction schedules (IBCC/UDC).

The Subcommittee FID/CCC-M 'Mechanization' has organized, jointly with FID/CR, FID/OM and FID/TM, the above mentioned 2nd Seminar on 'UDC in Mechanized Information Retrieval Systems' in Frankfurt. A special working group on Notation order has been set up to work in the area of ordering of UDC symbols, especially for computer use.

The extensive publications programme of UDC editions in various languages includes:

—further sections of the Czechoslovak, English, German, Hungarian, Polish, Portuguese, Russian, Serbo-Croat and Spanish full editions, and the start of a new full edition in Romanian;

—the alphabetical index to the French medium edition and continued progress with the English, Polish, Portuguese and Spanish medium editions, a Russian version having just been completed;

—publication of the Polish third abridged edition, as well as plans for an Arabic abridged edition;

—special-subject editions, including the WMO Guide to UDC and a proposed new edition covering the field of Documentation and Information Science (with the completed 03/04 schedules);

—'Extractions and Corrections to the UDC', based on the monthly issued 'P-Notes'.

All these activities are carried out by the FID/CCC and its 25 UDC revision committees, each responsible for a separate field of science, technology, etc.

Machine techniques and systems

The following two Committees carry out their activities in this area:
(1) The Study Committee on the Theory of Machine Techniques and Systems (FID/TM), the Chairman of which is Dr K. Samuelson, Research Group of the Institutionen for Informationsbehandling, Stockholm. The Committee members represent Canada, Poland, Sweden, UK, USA, Commonwealth Agricultural Bureaux, Commission of European Communities and ISO/TC 46.

The following major projects are on the Committee programme for 1970:

—systems design concepts for automated international information networks. The extended study will be focused on definitions, recommendations and structural formalization, provided that a sufficient number of technical reports is submitted for review. The Swedish study group FID/TM-Sw, founded in 1968, has offered to perform the study with the assistance of five system analysis experts. All material will be subject to fast communication and critical analysis in due time for the 1970 FID meeting in Buenos Aires;

—further active studies on possibilities to assist ICSU-Unesco UNISIST project and other international projects with regard to the previous item;

—further active studies on multiple-classificatory system-notation for referral-switch-directories between data-bases to facilitate centralized access to diversified data-bases. This work would be of assistance to FID/CCC.

(2) The Study Committee on Operational Machine Techniques and Systems (FID/OM) chaired by Mr M. Woitschach of IBM Deutschland, Singdelfingen, Germany, has its members from Belgium, Germany, Hungary, Israel, Japan, Poland, South Africa, UK, USA, Commission of European Communities and ISO/TC 46.

The following major projects are to be carried out by the Committee this year:

—review of problems and possibilities of small information systems. This is the continuation of the 1969 study of interface problems of manual and machine systems (giving also description of systems applicable for small installations). The first attempt in this direction was confined to machine preparation of manually readable records for information retrieval. A second study covers modern technical machinery and devices for direct access to stored information up to but not including large scale computers;

—promotion of national or regional state-of-the-art reports, to be prepared by the National Members of FID or by experts of the respective countries. FID/OM will restrict its activity to the drafting of not too rigid standards or norms for such reports.

Linguistics in documentation

The Study Committee on Linguistics in Documentation (FID/LD), chaired by Prof. W. Locke, Director of Libraries, Massachusetts Institute of Technology, Cambridge, USA, has its members from Hungary, Israel, Japan, Netherlands, Poland, South Africa, Sweden, UK, USA, Commonwealth Agricultural Bureaux, Commission of European Communities and ISO/TC 46.

The following two major projects are to be carried out this year:

—publication of *Linguistics in Documentation; Current Abstracts*. The journal will be published four times a year covering the narrow range of publications touching on linguistics in documentation but not including the documentation of linguistics. The first regular issue was published last month;

—survey (or state-of-the-art report) on Linguistics in Documentation. The project aims at determining not only how linguistics is being used (explicitly or implicitly) in documentation, but how it could or should be used. It is felt that in the last few years considerable progress has been made in applying linguistic thought to documentation and information science but that the information on the work is scattered and difficult to control. The first draft of the survey should be ready by the time of the FID/LD meeting in Buenos Aires next September.

Scientific and technical information for industry

The Study Committee on Information for Industry (FID/II), chaired by Mr K. Klintøe, Director of Dansk Teknisk Oplysningstjeneste, Copenhagen, has members from Canada, Czechoslovakia, Denmark, Finland, German Democratic Republic, Federal Republic of Germany, Hungary, Israel, Japan, Netherlands, Norway, Poland, Portugual, South Africa, Sweden, UK and USA.

The Committee has a sub-committee on 'Effective means of communicating scientific and technical information to industry' and two working groups: one on 'National Technical Information Services—Worldwide Directory' and the other on 'Technical Journals for Industry'.

The 1970 Committee programme includes the following projects:

—continuation of the study of effective means of communication of scientific and technical information to industry;
—preparation of the third edition of the *National Technical Information Services—Worldwide Directory*, the publication date set for the second part of 1970;
—preparation and publication of *National Lists of Technical Journals for Industry*, of which seventeen journals have already been published and twelve are in various stages of preparation. Plans for a cumulative international index are being elaborated;
—publication of a summary report of the Symposium 'Communication of Scientific and Technical Information for Industry', organized by FID/II in Rome last October.

Training of documentalists

The Study Committee for Training of Documentalists (FID/TD) is chaired by Dr A. Gorski, Chief of the Branch Information Centres, Industrial Institute of Agricultural Machines in Poznan, Poland.

The Committee members represent Belgium, Czechoslovakia, Denmark, Federal Republic of Germany, France, German Democratic Republic, Hungary, Israel, Italy, Japan, Netherlands, Portugal, Romania, South Africa, Spain, Sweden, UK, USA, USSR, Yugoslavia and Commonwealth Agricultural Bureaux.

The Committee programme for 1970 includes:

—survey of existing methods and forms of training in the field of information science, defining trends of development in professional training;
—model programmes of training for various categories of users;
—establishment of a central catalogue and, at a later date, central library of textbooks. The plans will be worked out using the recently prepared (by Aslib in co-operation with FID/TD) *International List of Textbooks*;
—list of non-conventional teaching aids (films, slides, records, graphs, etc.).

Needs of developing countries

The Special Committee on Developing Countries (FID/DC), chaired by Mrs S. Lévai, Acting Director General of the Hungarian Central Technical Library and Documentation Center in Budapest, consists of representatives of Belgium, Brazil, Chile, Czechoslovakia, Federal Republic of Germany, German Democratic Republic, Hungary, Israel, Japan, Netherlands, Poland, Portugal, Spain, Tunisia, UK, USA, USSR, Commonwealth Agricultural Bureaux and OECD.

The major project of the Committee for this year is the study of national structures for documentation and library services in countries with different levels of development, with particular reference to the needs of developing countries (a Unesco contract).

Working Groups

In addition to its Committees, FID also has the following Working Groups:

—Business Archives, chaired by Mr A. van der Laan, Director of NIDER, The Hague;
—Data Documentation, chaired by Dr H. Fink of Fabenfabriken Bayer Pharma, Leverkusen, Germany.

Regional Commissions

A special place in the activities of our Federation belongs to the FID Regional Commissions for Latin America (FID/CLA) and for Asia and Oceania (FID/CAO). These Commissions are very effective not only in bringing closer FID and countries of those regions but also in establishing close working contacts among documentalists of those countries.

FID/CLA, the President of which is Prof. Celia Ribeiro Zaher, President of the Instituto Brasileiro de Bibliografia e Documentaçao (IBBD) in Rio de Janeiro, has member organizations in Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Mexico, Uruguay and Venezuela.

Last November, the Commission sponsored, in conjunction with its regular meeting, the 2nd Regional Documentation Congress in Rio de Janeiro. The Congress agenda included such topics as: Scientific information and its use, Carriers of information (reprography, union catalogues, telecommunication), UDC (its use, present state and application in mechanized filing systems and information retrieval), Communication problems (terminology, translation, standardization, audio-visual equipment).

The Commission plans to hold its 10th regular meeting in Buenos Aires on 15th–16th September 1970 (during the 35th FID Conference there). The meeting will serve as a demonstration of the results achieved by the Commission in the first 10 years of its history (FID/CLA was established during the 26th FID Conference in Rio de Janeiro in 1960).

FID/CAO, the President of which is Professor Shigenori Hamada, President of the Electronics Association of Japan in Tokyo, has member organizations in Australia, Ceylon, Democratic People's Republic of Korea, India, Indonesia, Iran, Israel, Japan, Pakistan, Republic of Korea, Syrian Arab Republic, Thailand, Turkey and USSR.

The Commission, created in December 1968, held its first regular meeting in Tokyo last April. The agenda included Reports on the documentation activities in countries of the region, Programme of future activities of the Commission and Plans for promoting documentation in Asia and Oceania.

The description of the FID activities would not be complete without saying a few words about important work done by the General Secretariat of the Federation, whose twelve full-time staff members work in The Hague.

The major aspects of the work done by the Secretariat are as follows:

—co-ordinating the work of the FID Committees and Working Groups;
—studying and evaluating possibilities for contracts from other organizations and arranging these contracts;
—organizing various meetings (from small group meetings to international conferences);
—keeping FID Members and Affiliates well informed of all relevant current and forthcoming projects and events (both within and outside the Federation);

—establishing new contacts and maintaining the existing ones all over the world;
—representing FID at various meetings;

The technical activities are carried out by the Information and Classification Departments.

The Information Department, using its collections and files (the reference library has nearly 250 titles of current periodicals and more than 1,000 titles of monographs in the documentation field), carries out extensive reference and referral activities, up-dates its previously published directories of abstracting services, science information sources, etc. The monthly *FID News Bulletin* contains information on the major current and forthcoming events of professional interest (conferences, organization of information both at national and international levels, documentation techniques, directories, etc.) and includes quarterly Document Reproduction Surveys.

The Classification Department, which serves also as the secretariat for FID/CCC, co-ordinates the activities of the UDC revision committees, as well as the UDC development work at the international level in general. The Department regularly issues *P-Notes* (proposals for revision of the UDC) and *Extensions and Corrections to the UDC* (approved proposals).

At present FID is working out its new Programme, based on modern trends in the information field and on the latest achievements in information handling equipment. It is expected that the new Programme will be adopted by the FID General Assembly in Buenos Aires next September, thus giving new guidelines for the Federation's activities.

SUBJECT AND MISSION-ORIENTATED SCHEMES: THE INTERNATIONAL PATTERN AS INDICATED BY CAS, INSPEC, INIS AND OTHERS

DR J. W. BARRETT

Director of Research & Development, Monsanto Chemicals Ltd

Paper presented at a One-Day Conference on International Developments in Scientific Information Services, Royal Society, 10th June 1970

OUR THEME today is International Developments in Scientific Information Services but I intend to limit my remarks to computer-based secondary information systems. It is certainly not necessary for me to dwell on the great growth rate of scientific information except to remind us that it is this growth rate which demands new attitudes and the use of all available technology to permit adequate storage, retrieval and use of the ever growing store and daily output of scientific and technical information.

Until the 1950s our secondary information systems for all aspects of science and technology had remained basically unchanged, with information collected in the printed word and access via index of classical type. It is true that improvements had been constantly made, mechanical sorting and retrieval systems introduced and major steps made in nomenclature definition and standardization but the basis remained the reduction of original information to a more condensed form still stored in printed form.

Fortunately increased scientific information is accompanied by new technology, and in particular computer technology had been developing very fast after the discovery of the semiconductor properties of silicon in the late 1940s. It is dangerous to write history too quickly after the events but certainly it would seem that organizations representing the exact and biological sciences were the first to make real effort to harness the computer to the storage and retrieval of scientific information. The movement was greatest in the US but has been followed in other countries, particularly Germany, UK and USSR.

Let us look at some of the results. I am not attempting to make a comprehensive survey but rather to describe and compare a few fairly well developed systems covering different disciplines. The examples chosen are the Chemical Abstracts Service (CAS), the Information Service in Physics, Electrotechnology and Control (INSPEC), the Medical Literature Analysis and Retrieval System (MEDLARS) and the International Nuclear Information Systems (INIS).

The subjects covered by these four services and their respective originators are given in Table 1.

These services are in various levels of development, with CAS first providing computer-readable tapes in 1962, MEDLARS following in 1964, INSPEC starting in 1969 and INIS not yet operational. Table 2 shows the status of the first three services.

CAS is the most comprehensive service for its discipline to date, but it is still developing and experimenting. The computer-based services already vary greatly in scope and depth. Thus CA Condensates consists of the headings of all the abstracts in Chemical Abstracts (not on tape as a whole) amplified by key words appropriate to indexing, and issues weekly with each tape containing upwards of 5,000 entries. Basic Journal Abstracts consists of complete abstracts of all the papers from 35 journals considered basic to any library, whilst Chemical Titles covers upwards of 120,000 titles of papers from 700 primary journals. Chemical–Biological Activities and the Polymer services cover specialized fields of chemistry with a variety of indexes and detailed abstracts. Each service has to be a compromise between breadth and depth, breadth and speed, depth and speed, comprehensiveness and cost. Most make use of or will use the CAS computerized Registry System which identifies chemical compounds using a set of programmes which recognizes whether a structural

TABLE I

Service	*Originator*	*Subjects covered*
CAS Chemical Abstracts Service	American Chemical Society	Chemistry, including chemical engineering, chemical physics and biological chemistry
INSPEC Information Service for Physics, Electrotechnology and Control	Institute of Electrical Engineers	Physics, electrical engineering and electronics control
MEDLARS Medical Literature Analysis and Retrieval System	National Library of Medicine	Medicine, both clinical and non-clinical, and biomedicine
INIS International Nuclear Information Systems	International Atomic Energy Authority	Nuclear science, including marginal areas such as use of isotopes in industry, biomedical aspects

TABLE 2

Service	*Computer Tapes*
CAS	Chemical Titles Chemical-Biological Activities Polymer Science and Technology—Journals Basic Journal Abstracts—Patents CA Condensates
INSPEC	Physics Abstracts Electronic and Electrical Abstracts Computer and Control Abstracts
MEDLARS	Index Medicus

representation of a chemical compound is new or duplicates something already recorded. When available for outside use this Registry System will supply the chemist with many obvious services such as compound identification, correct compound nomenclature, and identification of references associated with a compound, but more excitingly, with substructure search. The registry already contained in 1969 over 1 million different compounds, over 2 million references and about 1½ million names.

Development is fast in this field and brings problems in development of economic operating systems; also there are bound to be differences for some time in the indexing policies and the systems for ordering the data between the different services. In the earlier years of development each organization was striving to handle its own discipline as efficiently as possible, but there is now an increasing effort to bring more conformity, or at least compatibility, between the various disciplinary services. This is essential for the exchange of input between the systems, and for the repackaging of computer data to service interdisciplinary needs.

TABLE 3. *'Indexing' Policy*

CAS	Uses free-text of titles and abstracts. CA Condensates uses 'keywords' but these are not from a controlled vocabulary
INSPEC	Free-text titles and abstracts, 'free' index entries, broad classification scheme, controlled subject headings
MEDLARS	'Keywords'—controlled vocabulary based on MeSH—Medical Subject Headings—hierarchically organized
INIS	'Keywords'—controlled by a version of the EURATOM thesaurus

TABLE 4: *Data Base Content*

CAS	Title, author, journal CODEN, bibliographic citation, digest (abstract), keywords, Registry numbers, molecular formula, place of work, patent citations —different mixtures in different data bases
INSPEC	Title, author, journal title (shortly CODEN), bibliographic citation, abstract, free index entries, place of work, broad subject classification code and some other minor information
MEDLARS	Title, author, journal title, bibliographic citation, MeSH terms
INIS	Title, author, journal title (no information if CODEN is used), bibliographic citation, keywords (thesaurus controlled), abstract (not clear if this will be on the tapes for searching)

Some of the more important aspects of indexing policy of the four services are shown in Table 3 and the major items of the data bases in Table 4.

The reduction of scientific information to computer language and storage gives us new and basically very fast methods of retrieval. In particular the great ability of the computer to select and rearrange required items of information from vast stores of information to fit specific inquiries holds out great promise. It is the programming for search and the setting up of operating search services that give us at one and the same time the greatest opportunity and the greatest problem. National collaboration becomes obligatory, decentralized output is increasingly practised. Table 5 summarizes the present availability of search programmes for the first three services.

Although CAS, INSPEC and MEDLARS originated in national organizations, the services have become increasingly international. Indeed it seems unlikely that any comprehensive computerized service of this kind can develop and operate successfully on a national basis. The trend continues towards international networks involving decentralized input, centralized processing and decentralized output. If the new computerized systems demand multinational operation, even more so must there be concentrated national activity, and this has proved another strong trend in the last few years.

TABLE 5: *Availability of Search Programmes*

CAS	CAS and other programmes (e.g. National Research Council of Canada, Karolinska Institute, University of Georgia) for IBM 360. UKCIS KDF9 programmes
INSPEC	None provided by INSPEC. Tapes are being searched using programmes developed for CAS data bases at Royal National Library in Stockholm, in Canada, at AWRE in the UK and elsewhere
MEDLARS	National Library of Medicine programmes for Honeywell and IBM 360 computers; National Lending Library use KDF9 programme. INSERM in Paris have their own programme for UNIVAC 1108

TABLE 6 *International Input*

CAS	Agreements with UK and Germany for development of British and German input
INSPEC	Various experimental arrangements in USA (e.g. IEEE), Germany, France, USSR and elsewhere
MEDLARS	Input from NLL Boston Spa, and from Karolinska Institute in Stockholm. Possibly from France
INIS	Input from member states of International Atomic Energy Agency (IAEA). Includes EEC countries, USA, USSR, UK, Scandinavia and others

Decentralized input into a computerized information system has much in its favour. The size alone of the task for disciplines such as chemistry, physics and medicine may necessitate it. However, the problems are considerable because of the need for highly standardized input and hence most attempts at international input are in the experimental and development phase. Table 6 presents some of the important programmes in being. The preparation at source of an abstract of a scientific paper in a form suitable for input into any international information service is an ideal to be pursued urgently. Major national publishing learned societies are in a good position to do this and some are responding effectively, but much remains to be done in achieving consolidated effort within major publishing countries. CAS has estimated that the national sources of chemical literature are: US 30%, USSR 21.3%, British Commonwealth 12.2%, Germany 6.8%, Japan 6.4%, France 5.0%, others 18.3%.

The regular printed output of a computer system in the form of indexes, abstract journals, etc. probably demands no treatment different from the conventionally prepared volumes but it is the output direct from the computer to an inquirer to suit his own need which contains the greatest potential for satisfying the need for pertinent information. It is this second type of output which requires quite different treatment, with maximum decentralization consistent with cost. Regional centres for CAS have been set up within the US, and in the UK, Denmark, Sweden and Holland. They vary in extent of services offered but collaborate and exchange experiences through OECD panels and committees. MEDLARS also is operated through regional centres in the USA, Sweden and France. Table 7 lists the main output centres for the four services considered.

There is no one national pattern of organization of scientific information services. Government, learned and publishing societies, national libraries and scientific institutes, universities, industry are involved to varying extents. In a few countries there is a comprehensive national organization for information: for example Japan has recently set up a national information system for science and technology (NIST) to develop integrated operations of collection, analysis, evaluation, control and dissemination of all scientific and technological information. Existing organizations, such as the Japan Information Centre of Science and Technology (JICST) and university libraries, become component parts of the NIST and the research division of JICST is being expanded to meet the needs of the whole. Overall priorities on areas of activity have been set up and within these co-operation with established systems such as CAS and MEDLARS is proceeding.

TABLE 7: *International Output*

CAS	Various centres in US regional centres in UK, Denmark, Sweden and Holland
INSPEC	At present negligible for tape data bases
MEDLARS	Regional centres in UK (NLL and DPC), Sweden (Karolinska Institute), France (INSERM) and in USA. Also centrally at NLM in Washington
INIS	Tapes produced in Vienna will be disseminated to members: also a centralized service

TABLE 8: *The UK Consortium on Chemical Information*

Members
The Chemical Society
The Faraday Society
The Royal Institute of Chemistry
The Society for Analytical Chemistry
The Chemical Industries Association
The Biochemical Society
The Institution of Chemical Engineers
The Royal Society
The Society of Chemical Industry
Aslib

Observers
The Chemical Abstracts Service
The Office for Scientific & Technical Information

In the UK co-ordination and collaboration between organizations concerned with scientific and technical information are stimulated and encouraged by the

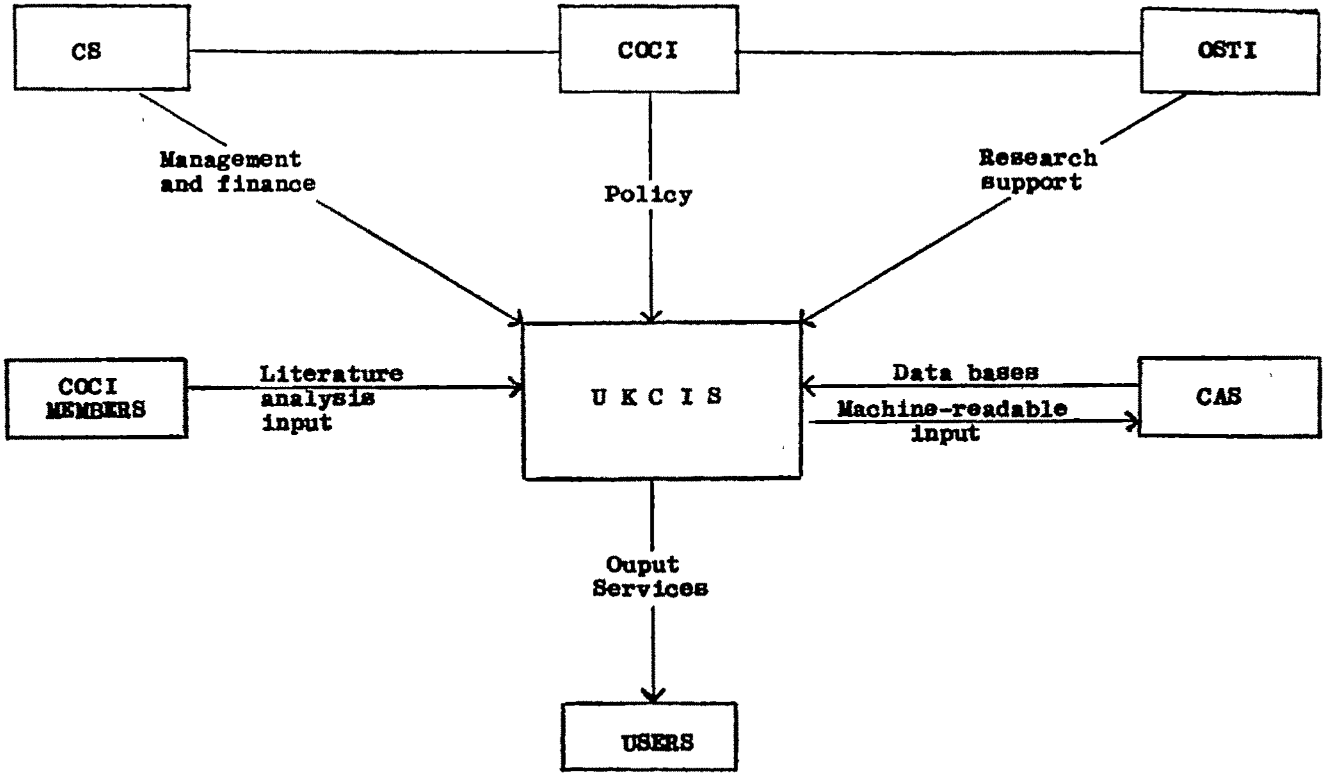

TABLE 9: *UKCIS relationships*

Office of Scientific & Technical Information (OSTI) of the Department of Education & Science. As in many other countries development of the newer services is aided by government funds deployed through OSTI. The services in chemistry, physics and electronic engineering have owed much to the efforts of the Chemical Society and the Institution of Electrical Engineers; now the UK Chemical Information Service (UKCIS) and INSPEC are managed by these societies. To ensure that UKCIS is developed to serve effectively all chemical interests a consortium has been formed of industry and learned society to give guidance to this comprehensive information system in chemistry. Its membership is shown in Table 8 and its relationship to UKCIS, the Chemical Society and OSTI summarized in Table 9.

TABLE 10: *Derwent Documentation Services*

Name Service	*Commencement date*	*No. of documents processed per annum*	*Coverage*	*Source of documents*
FARMDOC	1963	6,750*	Patents related to pharmaceuticals	Patents issuing in 14 countries of major patent importance
AGDOC	1965	3,500*	Patents relating to agricultural topics	
PLASDOC	1966	20,000*	Patents of plastics, polymers and related topics	
RINGDOC	1964	45,000	Journal literature of interest to the pharmaceutical industry	Over 500 leading journals of international importance
VETDOC	1968	6,000	Journal literature relating to the manufacture and use of veterinary products	
PESTDOC	1968	10,000	Journal literature relating to the manufacture and use of agricultural chemicals	

* Basic or First issue patents.

Similar consolidation of interests have evolved in Germany, Sweden, Denmark and Holland. OECD has played a major part in encouraging such national consolidation and in enlarging international collaboration. In 1965 the Information Policy Group (IPG) of the Science Policy Committee was formed to this end. Chemistry was chosen as a specific subject field for study and the economics of information taken up for study on a general basis. Compatibility of systems was soon recognized as a most important issue and an Information Systems Panel was formed to permit real exchange on systems not only to improve compatibility but to allow the development of information networks.

Vital to the processing of scientific and technical information are standard nomenclature systems and the major international unions covering most fields of science have been increasingly concerned with this. In particular IUPAC

(International Union of Pure & Applied Chemistry) has for many years worked on standard nomenclature systems for organic and inorganic chemistry; its recommended systems, admittedly incomplete, are used extensively and particularly in the CAS computerized programmes. The work has recently been extended to polymers through a new nomenclature committee of the Macromolecular Division of IUPAC and just beginning is a study of methods for standardization and codification in the machine handling of chemical information. Some of us are suspicious that traditional nomenclature systems have been patched and stretched beyond their intrinsic capabilities. The popularity of trivial names in chemistry supports this. The advent of computerized systems demands nomenclature which can be transferred uniquely to machine language and which at the same time conveys information unambiguously to the human user. The task is big and needs the convergence of talent and experience which international organizations of this kind can effectively organize.

To try to be exhaustive on this large subject would be absurd but clearly there are many other developments throughout the world in secondary information services for science and technology. For long the commercial firm, Derwent Publications Ltd, has supplied services on patents and on certain limited areas of applied chemistry; computers have extended and deepened these services, which are summarized in Table 10.

The Institute for Scientific Information of Philadelphia (ISI), is well known for its *Current Contents* covering the contents pages of a large group of journals, with enrichment of the items by terms such as structural diagrams for chemical compounds. For chemistry the Index Chemicus and the Index Chemicus Registry System are separately available for providing information retrieval on new chemical compounds. ISI has also developed a novel Scientific Citation Index which through the associated search service, ASCA, permits a forward search of the literature from an identified publication containing a basic theme, hypothesis or new compounds.

In 1967 the Internationale Dokumentationsgesellschaft für Chemie (IDC) was founded in Germany to make available to a broader public computer indexes, files and tapes developed jointly by a few large German chemical companies and covering in considerable depth organic chemical compounds and reactions.

In the medical field Excerpta Medica Foundation, an international non-profit organization, is now, after five years' intensive work, able to offer a comprehensive magnetic tape service in biomedical, pharmacological and chemical information on experimental and marketed drugs and chemical compounds. This is part of the broad computer-based storage and retrieval programme of Excerpta Medica which includes the publication of a range of Abstract Journals covering defined areas of biomedicine based upon a computerized bank of data accumulating from over 200,000 journal articles per year. It too has been effective in helping to rationalize the chaotic nomenclature of medicine by the development of a thesaurus of preferred medical terms.

A service for geoscientists is available in *Geotitles Weekly* which indexes upwards of 100,000 titles per year. Computer retrieval programmes are available and work is in hand to transfer to computer all data back to 1956 for rapid retrieval.

Apart from the discipline or broadly based information services there is much activity in the development of services for specific subjects and narrow areas of technical interest. It is the hope that these will be fed increasingly from the data banks being built up for the major disciplines, but for the time being much input is likely to continue through the more traditional routes direct from the primary literature. An interesting example is the Biodeterioration Information Centre operating in the Technological University of Aston in Birmingham. It is one of six experimental specialized centres supported by OSTI, and is formally recognized by the OECD Biological Deterioration of Materials Research Group and also by the International Biodegradation Research Group. It collects its input through a co-operative specialists scheme through which experts all over the world each scan a small number of journals (over 7,000 are covered). Some primary and secondary literature is scanned at the centre, and uses of computer-based SDI services are being explored. Abstracts are published quarterly in classified form in the *International Biodeterioration Bulletin Reference Index Supplement* (*IBBRIS*). The centre also operates a question-answering service and publishes the *International Biodeterioration Bulletin* (*IBB*).

Another specialized information project was initiated in the Department of Physiology of Sheffield University in 1966 and illustrates well how the large computerized information services may be increasingly used to give services on areas needing multi-disciplinary knowledge. For this Intestinal Absorption Information Centre computer search is made through profiles presented to MEDLARS, ASCA, Chemical Titles and CBAC tapes. Monthly bulletins and indexes of information are published at very reasonable cost and retrospective searching is also available.

Even this brief review, by no means comprehensive, reveals considerable international activity at working levels towards establishing computer banks of global scientific and technical information. Interlocking national and regional services to make full utilization of these comprehensive stores are developing. However, much remains to be done to realize the enormous potential of computer storage and processing of information; strong international collaboration and planning is more than desirable. This is best based on coherent national activity and fortunately we have good evidence that substantial progress is being made at both the national and international levels.

Mention has been made of the part that OECD is playing and it would be fitting to conclude with a comment on the Unesco programme exploring the feasibility of a world science information system. This is being done with the International Council of Scientific Unions (ICSU), through a joint committee, which has created six working parties assigned specific tasks such as indexing and classification, language problems and research needs. The final report on feasibility is promised for consideration at an international conference at the end of 1971. (See also J. R. Smith's paper, p. 395 et sep. below.)

THE FEASIBILITY OF A WORLD SYSTEM: UNISIST BY ICSU OUT OF UNESCO

J. R. SMITH

Chairman, UNISIST Advisory Panel

Paper presented at a One-Day Conference on International Developments in Scientific Information Services, Royal Society, 10th June 1970

THE TITLE of this paper, not of the author's choosing, is tempting: but to follow the analogy too far might be dangerous.

In 1966, Unesco and the International Council of Scientific Unions (ICSU) were each considering ways by which the transfer of scientific information could be more efficiently effected on an international scale. It became apparent that a merging of these two activities would seem to offer the best chance of success, and so a joint ICSU/Unesco working party was convened in January 1967, and the main recommendations arising from this meeting have been summarized by Dr A. Perez Vitoria as follows:

1. The proposed World Science Information System (UNISIST) should be a flexible network based upon the voluntary co-operation of existing and future information systems.
2. It should be restricted initially to the natural sciences. However, it should be extended as soon as possible to technological information and provision should be made to apply the experience gained to other fields of learning in due course.
3. To the extent necessary to facilitate transferability and selectivity of information, the study should include questions of standardization on which extensive work has already been done by competent organizations with which close relations are essential.
4. In view of the increasing importance to developing countries of science and scientific documentation and information, the study should pay special attention to the needs of scientists in these areas.
5. Careful consideration should be given to overcoming the problems of language barriers in the communication of information.[1]

Central Committee

A Central Committee was established, which comprised representatives of both organizations, and this committee appointed a number of working groups and an advisory panel to examine and report on certain aspects of the work. Some brief observations on the work of these groups and the advisory panel follow.

Working group on bibliographic descriptions

This working group has been operated jointly with the ICSU Abstracting Board and the member services of ICSU-AB have indicated their firm intention to implement the recommendations of the working group at the earliest practicable date. Among those things which the recommendations cover are definitions of essential and supplementary elements in a bibliographic record, and language problems and transliteration are also dealt with. A manual will be published in which the rules for the writing of bibliographic descriptions, after having been tested internationally, will be defined in detail. ISO have indicated their willingness to liaise directly with UNISIST with a view to the possible adoption of the working group's recommendations as international recommendations. One proposal which was received favourably by the Central Committee was that an internationally acceptable system (referred to as the International Serials Data System) was required to provide adequate and accurate bibliographic identification of the source literature for science and technology. The system would have to be responsive to the needs of the entire information transfer community. The working group recognized the technical feasibility of this system and has recommended the establishment of an international network to accomplish this objective, subject to the proviso that the costs bear a substantial relation to the benefits that users could gain from such a service.

Working group on research needs in documentation

Two major areas have been identified which require examination towards better techniques of information handling. One is linguistics, since the main vehicle of scientific documentation is natural language. The other is computer science in its relationship to information transfer. These topics give rise to a large number of problems which need to be considered. However, it is the view of the working group that none of these requires that new organizations be established to carry out the proposed research programmes. UNISIST should limit itself to encouraging, supporting and taking advantage of research in these areas, carried out by experts in various parts of the world.

Working group on language problems

Two different levels of language problem have been identified. One, between different languages, and the other, the more important in the opinion of the working group, of the interface between natural and documentary languages. The difference between the concept of transfer of knowledge on the one hand, and transfer of information on the other, has been emphasized, as have the varying rates for extracting knowledge from information in different languages, depending on whether it is in written or oral form. The group has recommended that there should be a more systematic study of language teaching.

Working group on scientific information in developing countries

In order to take an effective part in the advantages and the obligations of UNISIST, all developing countries or groups of countries should maintain a national or regional scientific and technical information agency. Such agencies would need to have a strong library network, incorporating the usual basic services and, in addition, establish a clearinghouse for the documents of importance to national development programmes and operate a translation service. It is not necessarily to be expected that machine methods would immediately be available to some of these agencies. However, they should be prepared to consider the establishment of facilities which would make them able to become involved in the international exchange of machine-readable data. These and other minimal technical requirements have been identified by the working group as those which would enable countries or groups of countries to derive benefit from UNISIST.

Advisory Panel

The Advisory Panel established by the Central Committee is composed of representatives of large operating systems. Its purpose is to advise on matters referred to it by the Central Committee and in particular to represent the point of view of operating services who might be expected to become involved in the voluntary co-operative programme which is UNISIST. The Panel had the opportunity to discuss the outline of the first draft of the UNISIST report with the author and subsequently to review in detail the text of the report and to convey their views to the Central Committee. Although the Panel cannot by any means be said to represent the whole of the secondary services, they are able from their knowledge of operating large services and from their experience of the economics of this kind of activity to react in a practical sense to the proposals which are being considered.

Comparative study on classification of science information

A study on this subject was funded by ICSU and a report has been placed before the Central Committee. The main conclusion of the report was that either a new classification or a concordance between various classification schemes is technically possible, but that the feasibility of either would depend on the use to which it was to be put, hitherto unspecified. The report states that at the present time no single existing classification scheme is adequate for a worldwide classification of science. In a discussion on the report it was suggested that hierarchical classification dated rapidly and soon became inadequate, and that in general universal classifications appeared to be of most use to scientists in the fields other than their own. It was also suggested that as an expedient it might be sensible for UNISIST to develop a standard list of subject headings, covering all areas of science and technology, to facilitate the worldwide control and exchange of scientific literature in broad categories and then to use thesauri for deep content analysis.

The work of the various groups has been reviewed from time to time by the Central Committee and reports of this work were made available to Professor J. C. Gardin, who was entrusted with the task of preparing a draft UNISIST report on the feasibility of a world science information system. The first draft report was placed before the Central Committee at its 4th session in Paris on 15th–17th December 1969. The report concluded that such a system was feasible and that conceptually it should be based on existing components. The bulk of the report contained technical recommendations leading towards the system, but it also contained a summary of the duties encumbent on policy makers. The need for a co-ordinating body on which governments would be represented was emphasized. The co-ordinating body was seen as directing an executive permanent staff. The report, which was extensively discussed by the Central Committee, was recognized as an important source document which, among other things, had been very successful in putting a number of basic facts and problems into better perspective. The report is now being redrafted, taking account of the views of the Committee, and some examples of matters to be taken into account in the redraft may give an indication of the nature of the report.

Although the proposals included in general provided for a flexible network, there was some thought that they might be too mandatory and should be toned down to reflect more faithfully the basic UNISIST concept of voluntary co-operation among existing and future services. The attractions of an involvement in the UNISIST system and the possible financial and other benefits to be derived from such association, and indeed the effects of UNISIST on potential participants, needed to be developed more emphatically. One pointer to the need for such a world science information system was the cost of duplication of research.

Although consideration had in the first instance been specifically limited to science, it has been pointed out that science and technology can only coexist as a result of mutual interaction and feedback of one upon the other. Nevertheless, it is considered that UNISIST should develop through a process of evolution and that its scope should also evolve with time.

Emphasis must be given to the importance of resolving the problems of developing countries. The main issue was that of bringing most of these countries to a threshold from which they could begin to benefit from existing information services.

The organizational structure of UNISIST should be flexible; over-centralization should be avoided and emphasis should be given to the catalytic function, one manifestation of which could be the establishment within UNISIST of a unit charged with the responsibility of following research developments in the world of scientific and technical information. The need for a referral service in the field of scientific and technical information was likewise expressed. The role of centres for the evaluation of scientific and technical information should be emphasized. The reliability of information should be paramount and that should not be overshadowed by emphasis on accessibility.

The second draft of the report, which takes into account the views of the Central Committee, has been written and was considered by the Committee in May 1970. It is expected that a final report will soon be prepared, which will be widely distributed and made available for comment. It is the intention of the Central Committee to seek as many and as representative views as they can, so that they may have the fullest possible benefit not only from those concerned with information transfer, but also from every kind of user.

It has been thought that the first major step in the implementation of UNISIST should be the convening of an intergovernmental conference which will be held late in 1971 and be sponsored jointly by ICSU and Unesco. The conference would not only consider the relationship of governments to such a system, but would take as its basis for discussion the UNISIST report and the reaction to it from the community. It is hoped that the outcome of this conference would be the establishment of a world system.

REFERENCE

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INVESTMENT IN HUMAN RESOURCES

LORD RITCHIE-CALDER

Chairman, Metrication Board

Paper presented at a One-Day Conference on International Developments in Scientific Information Services, Royal Society, 10th June 1970

ONE OF the good-intentioned phrases which has become current in international relations is 'investment in human resources'.

The fact that it is current at all is an important advance in human thinking. There was considerable enlightenment when, under the Charter of the United Nations of 1945, the Economic and Social Council was set up, but it was 'economic' and 'social'. 'Economic', for that purpose, implied the traffic in hardware. Development meant, essentially, the extraction and use of raw materials, and investment meant putting money into the means of extracting and using them. The whole thing was regarded as a matter of book-keeping. If the financiers could be persuaded to find the money and invest in capital equipment —Bob's your uncle! Or, as it turned out—Sam's your uncle!

In this kind of thinking human beings were incidental or consequential—incidental, because they would be available if you wanted them for the job, or consequential, because they would be the beneficiaries of the process. 'Social' was concerned with the latter. The Specialized Agencies of the United Nations, The Food and Agriculture Organization, Unesco, ILO and the World Health Organization, were concerned with conferring the benefits, the product of the economic process. The preamble of each of their Charters resounded with good intentions.

Because the emphasis was financial the process stemmed from Bretton Woods, and the setting up of the International Monetary Fund to regulate the currency of world trade and the World Bank as the teller or dispenser of that currency. The World Bank was conceived in the austere terms of sound banking. Loans would be given to countries which proved they could meet the terms and repay with interest.

It did not work. Even at the simplest level emerging countries did not have the people qualified to spell out the arguments for an 'over-draft' or the people competent to produce the specified result. They did not know what they were asking for nor what they would do with it if they got it.

So, in 1948, the Economic and Social Council passed a resolution recommending 'technical assistance'. This was taken up by President Truman as the fourth heading of his inaugural address as President of the United States, 20th January 1949. His Point Four stipulated 'We must embark on a bold new programme for making the benefits of our scientific advances and our industrial progress available for the growth and improvement of under-developed countries'. This, as far as the Americans were concerned, was to be bilateral aid but also some generous funding of multilateral aid through the United Nations in which nations according to their means would voluntarily contribute. The United Nations Technical Assistance Fund was to give additional resources to the Specialized Agencies who would find the experts and supervise the field work. Under this scheme the countries who asked for technical assistance had to find counterpart funds and counterpart people. The international teams would be sent and paid at international cost but their maintenance and facilities within a country would be paid for in the currency of that country. So would the people who were to be trained and take over when the international team had done its job.

This did not really work either. With a good deal of on-the-spot experience in many parts of the world, I called it 'window-shopping'. The international teams could demonstrate what was possible and efficiently train their counterparts. But what they were doing was demonstrating the excellent possibilities if the country had the capacity to follow through. In practice, it was like walking down the High Street with no money in your pocket and a plate-glass window between you and what you had been told was eminently desirable, and, indeed, absolutely essential. It produced frustration among those who were involved in such demonstrations and amongst governments who found that it involved future commitments they could not afford, like a housewife being talked into a hire purchase agreement by a fast-talking salesman on the doorstep.

So we had to improvise again. The World Bank constrained by the principles of sound banking, like a sympathetic bank manager having to demand a collateral, had to invent IDA, the International Development Association, which affiliated to the Bank could provide loans on easier terms than those imposed by strictly commercial standards. There was also created the International Finance Corporation which could provide finance for private undertakings on reasonable terms. Alongside the Technical Assistance Fund was set up the UN Development Fund, administered by Paul Hoffman who had been the mastermind of the Marshall Plan which put Europe back on its feet after the ravages of war. The 'development' in this case meant mainly providing the infrastructure, the kind of facilities which would be a precondition to investment. A sophisticated analogy would be the British 'trading estate' providing the roads, the electricity, the water supply and the buildings as an inducement to commercial undertakings to instal their plants. The UN Development Fund and the UN Technical Assistance Board were later merged in the present UN Development Programme.

The disappointments of the first International Development Decade in the 1960s showed that such contrivances were not effective in reducing the disparity between the rising prosperity of the advanced countries—that is, the countries with science and technology, and the developing countries which, comparatively, were getting poorer. It is estimated that all the investment and all the so-called development in the developing countries had increased the standard of living of the average person of those countries by about $.1 per year. And as I said once, all the millions invested in the Indian textile industry had not added an inch to the average Indian's shirt-tail. There were a million more shirts but there were millions more Indians wanting shirts. This factor, the increase in population is, of course, a dominant one but, without discussing here the population crisis, I would point out that it was the result of the intervention of science and technology, of medical science and medical practice. They had produced the means by which the death rate could be reduced so that young people survived to marry and to have children and people would live longer—adding up to the terrifying sum of more-mouths-to-be-fed. That figure is now over 3,600,000,000 with the certainty that, short of a man-made cataclysm, there will be 7,000,000,000 by 2000 A.D.

Out of the experience of the past twenty-five years emerged this concept of 'investment in human resources'. The compassionate attitude that people are there to be helped had motivated the social programmes of the specialized agencies but it took quite a while to grasp, in terms of promoting prosperity, that human resources were as important as material resources. Human ingenuity and skills and, of course, technical competence in general are needed to convert these raw materials.

It is difficult for me to understand why institutionally minded people are so obtuse. I recall that when Lord Boyd Orr was trying to promote the World Food Board which never materialized, his experts came up with what we are now calling 'investment in human resources'. In 1947 it was regarded as economic heresy. But all they were proposing was that supplying food to workers on, say, a dam should be treated as much a part of capital cost as the steel going into that dam. It wasn't even a new idea. Seti I, in Egypt 3,300 years ago, applied it when he provided for his temple workers '4 lbs bread, 2 bundles of vegetables and a roast of meat daily, and a fresh linen garment twice a month'. He did it because it paid, in providing the stamina and reducing the turnover of labour.

The idea of edible currency and Boyd Orr's proposal to use food as one way of funding industrial development may have sounded 'screwy' in 1947, but a few years later it was being used to get the United States out of an embarrassing situation. Remembering the 1929 slump, when the fall in farm prices bankrupted farmers and started the stockmarket collapse, successive American governments had provided price supports, buying up the farm surpluses to keep up the market price. So the silos and granaries were bursting at the seams and the hulks of wartime Liberty ships which had brought lease-lend food to Britain were loaded to the gunwales with surplus grain. Public Law 480 was passed allowing the Federal Government to make loans of food to foreign nations. If, say, India needed a million tons of grain in an emergency, the United States would supply it at world market prices. But that was just the book-keeping side; the USA would not seek to recover the dollars. Instead the Indian government would sell the grain in rupees and the money would represent American counterpart aid for development programmes agreed between the two governments. Thus the grain which had filled Indian stomachs in emergency would represent money to be invested in US-sponsored projects. It would be used to buy fertilizers for the following year's crops, or to build fertilizer plants for subsequent years, or to finance agricultural research, better seeds, better irrigation and so on. Thus meeting a short-term need would provide a long-term investment. In America, the effects were also gratifying. The taxpayers' money, buying the food-in-surplus, had put money in the farmers' pockets. They had bought their cars, their tractors, their wireless sets, their wives' clothes. Commerce had benefited. The shifting of the grain to India had reduced the cost of storage. It had paid the truckers, the railmen, the stevedores and the mercantile marine. It had created incomes which could be taxed, so that the internal revenue recovered at least as much as had been spent on the price-support. As an American economist said: 'It was all done by mirrors.'

All so-called aid was not so intelligent. Half-way through the Development Decade, the World Economic Survey was already showing why it was bound to fail. The annual inflow of long-term capital, from all sources, public and private, to the developing countries, was $9,000,000,000 per annum but the annual burden of debt-charges on previous loans was $5,000,000,000. Five-ninths of all money borrowed was going to repay the interest on money already borrowed. This was what I called 'Feeding the tapeworm'. If you eat, you feed the tapeworm and it grows; if you do not eat, the tapeworm dies but so do you. In the same way if you borrow money you increase the debt-charges. If you do not borrow money, because of the debt-charges, you cannot develop. It is self-defeating.

All this may seem singularly irrelevant to the theme of this conference. I assure you that it is not. It demonstrates that the conventional approach to aid has not worked. Even the World Bank has recognized this. The present director, Mr Robert McNamara and his predecessor Mr George Woods, have both been forthright in their demands for a new thinking.

A first concern in that new thinking must be 'investment in human resources'—helping people to help themselves. At the basic levels it means better nutrition, better health and improved conditions of life. Conventionally, those have been regarded as the social services which are the products of prosperity. Now they have to be considered as the preconditions of prosperity—the human infrastructure. But in the conversion of the resources, human and material, of a country to the techniques which produce prosperity, the paramount need is for sharing knowledge and skills.

At the UN Conference on Science and Technology for the Benefit of the Less Developed Countries, at Geneva in 1963, we used the phrase 'The Leap Across the Centuries'. If you examine what is meant by the 'centuries' which divide the advanced countries and the impoverished countries, you would find that it is the past two hundred years—roughly dating from the steam-engine as a prime-mover in the Industrial Revolution. By the geographical conjunction of iron to make the machines and fossil fuels to power them, first Britain, then Europe, then America, moved into mass production and commercial prosperity with the subsequent wealth which subsidized education and science and the research and development which accelerated technology and more wealth. Incidentally, I have sometimes speculated what would have happened if Faraday had preceded Watt and hydroelectricity and not fossil fuels had provided the motive power. The industrial map of the world would have been very different.

When Pierre Auger said that 90 per cent of the world's scientists who ever lived were still alive, he meant that most of the great scientific advances, with their technological consequences, had happened in the last fifty and, spectacularly, the last twenty-five years. If he had spelled them out, those scientists would have been mainly the products of the educational processes endowed by the Industrial Revolution, with two-thirds of the world's population scientifically and technologically disadvantaged because they had had no part of that Industrial Revolution except as the providers of fodder for the factories. This has nothing to do with innate aptitudes (except that in a scientific and technological society they are deliberately and consciously encouraged). It has everything to do with opportunities.

To 'leap across the centuries' needs a springboard or at least a solid foothold. In the developing countries there is a morass of poverty and ignorance. Therefore, if we mean what we say, we must throw a life-line to jerk them out.

In the past twenty years, I have travelled over 2½ million miles, mainly for the United Nations and its specialized agencies, Unesco, ILO, FAO, WHO and the UNDP, to see how science and technology can be applied to reducing the disparity between the advanced countries and the impoverished. With a great many frustrations and, perhaps, lessons well-learned, I am still convinced that we can transform the situation if we share our knowledge and skills at all levels.

I say 'at all levels', because a great many of the mistakes and failures have been due to wrong assumptions, and wrong timing. One of the salutary lessons was what happened in the Uttar Pradesh. In this state of India, there was the Kipling jungle, the actual geographical jungle of the Mowgli books. Two thousand square miles was in fief to the mosquito. The area was cleared of mosquitoes in the anti-malarial campaign of the WHO. The FAO moved in to reclaim the jungle and, with the British experience of the ill-fated groundnut scheme in East Africa, it was ecologically well done, with due concern for wildlife and vegetation cover to temper the monsoon rains. Rich arable land was settled by industrious peasants from the Punjab. They were provided with farm implements. The World Bank, through the Indian Government, provided tractors. Presently, the FAO had to go back again to devise harnesses by which elephants could draw the farm implements. At that stage, tractors, mobile power units, were useless because people had not been properly trained to handle them or repair them. Repair shops and training centres were set up and later tractors became a manageable proposition.

There has been a tendency to underestimate the capacities and traditional experience of illiterate peoples. Tradition, in this sense, means remembered values, or as I once put it, experience is a damned good substitute for experiment. If you study why people do things in a certain way, it will often, if not invariably, be found that there are good reasons for so doing and that alien methods may be positively wrong—although that does not mean that indigenous methods, in awareness of their context, cannot be improved.

At the level of illiteracy, a great deal can be done. People do not need book-learning to appreciate new ideas and adapt them. And it is the experience of technical assistance the world over that when people begin to acquire and apply knowledge they want to communicate; they want to be literate. This has been positively embarrassing. In the early days of Unesco, we had the concept of 'fundamental education'. I called it, in 1946, 'creating the climate of literacy'.

The idea was that you went among peasant peoples and helped them to understand better improved nutrition, improved methods of agriculture, improved health measures and so on, and while they were actually benefiting their present condition they would begin to recognize the need for their children being schooled. We were thinking of enlisting the support of the parents for the education of the next generation. What it produced in countries short of educational facilities and above all a shortage of teachers was a demand for *adult* education, as well as child education.

I am enormously encouraged by the growing insistence on 'intermediate technology', simple techniques consistent with their present needs—improving their own tools and their own methods while progressing, we hope, to more advanced methods and with institutions of higher learning (very much in short supply at present) to sophisticated technologies.

I repeat 'at all levels'. We need primary schools; we need secondary schools; we need technical schools; we need technological colleges; we need universities. And we need in each country 'centres of excellence'. If they have to rely on 'centres of excellence' abroad, they will find that their 'excellent' students will be brain-drained—not just because of the fleshpots but because in their own countries they will not have the facilities. I have immediately in mind (out of dozens I could cite) a brilliant Nepalese who distinguished himself in this country as a theoretical physicist and, loyally, went back to Nepal to teach elementary physics.

How, once you have collected scientific information and evolved the techniques of making it available, do you put it to work? Again I start at the lowest level—my own as a popularizer of science. As the recipient of the Kalinga Prize, awarded by Unesco for the promotion of the common understanding of science, I had to tour India to encourage that common understanding. I already knew the eminent Indian scientists and had first-hand experience of their scientific institutions. My concern was not with them but with the grass-roots. One of the encouraging things I found was that, surprisingly, it was easier to 'get across' science to ordinary people in India than it had been to break through to readers of the popular press in this country. Back in the 1930s I had had to call my science feature in the *Daily Herald* 'Reporting Progress'. Science was an off-putting word. The ordinary chap felt that if a science graduate had to spend all those years at the University learning about science how could he, the ordinary chap, hope to understand? And science was a bogey-word, threatening their jobs and even their lives. So one had to sneak up on the reader and convince him that it was not like that at all. In India, however (and in other countries, I've found), there were not the same inhibitions or resistance. There was also no 'scientific jargon'. In the vernacular languages, if you wanted to talk about a nuclear reactor, you had first to explain what it was. One of my books is in all the vernacular languages of India, in addition to Hindi. I do not pretend that in terms of the scientific information which you are discussing here it conveyed very much, but I like to think that it encouraged the understanding of science and that a lot of inquiring minds may have been stimulated to find out a lot more and, among the younger Indians, to take up science. One thing I learned was that you can only teach a subject, even science, if you approach it not only in the literal language but in the idiom and the common experience of the people. Once they are over that hurdle, they are not 'Indians' they are scientists, with minds accessible to the information you have to offer them and in terms which are universally valid.

The methods by which scientific information, which would enable the developing countries to make 'the leap across the centuries', is assembled and stored and communicated are of utmost importance. Our present technologies, and more to come no doubt, whether through data banks and other computer methods, or through electronic visual recordings or via communications satellites or (I hope under strict international control) from direct broadcasting satellites, will make a great contribution and reduce the timescale of change.

I am involved in another 'exercise' which could help: I was on the planning committee of the Open University and am now on its council. An important item in our remit, when it came to us originally as 'The University of the Air' was that the techniques we developed and the materials we produced should be considered as a service to the developing countries. This is a challenge to the science faculty of the Open University. This, at least at university level, could be the effective sharing of knowledge and skills.

Time is not on our side. President Truman's 'bold new programme' was not bold enough, nor novel enough, nor imaginative enough. We cannot buy our way out of this world predicament in which every big scientific and technological advance makes the rich countries richer and the poor countries, by comparison, poorer. In the Second Development Decade, let us try investing knowledge.

GENERAL DISCUSSION

CHAIRMAN: PROFESSOR SIR HAROLD THOMPSON, CBE, FRS

One-Day Conference on International Developments in Scientific Information Services, Royal Society, 10th June 1970

Morning session

MR J. M. CRADDOCK (Meteorological Office, Bracknell) said that the 130 or so members of the World Meteorological Organization were presently planning improved systems for the collection and transmission of meteorological data, under the general title of the Western Weather Watch, and for the storage and retrieval of this data for research, exchange and other purposes. The current world stock of data digitized for computer use exceeded 10^{12} decimal digits, divided among many centres, with a large annual increment. The problems of exchanging and manipulating these data were to be reduced by the adoption by WMO of the recommended standard type of magnetic tape and recommended formats for the exchange, etc., of nearly all types of data. The problem of a system of cataloguing and classification suitable for world use was becoming urgent, both for data and, to a lesser extent, for the increasing stream of meteorological literature. The three speakers had given excellent and lucid accounts of the work which was being done to set up international standards for the classification and exchange of information, but the question arose of whether the mechanisms of discussion and decision could work quickly enough to keep ahead of the requirements of the computer age. As an example of the time scale on which firm guidance would be desirable, the British Meteorological Office was to acquire an IBM 195 computer which was about one hundred times more powerful than the one at present in use, and would be one of the most powerful in Europe. This was due to become operational by October 1971 and by that time decisions had to be taken on the cataloguing of data, which, if possible, would have to be in line with thinking elsewhere. However, decisions had to be reached even if intentions elsewhere were unknown, and once these decisions were embodied in computer programs they may be hard to modify or reverse.

MR JUDGE agreed with Mr Craddock's comments, but thought all the blame should not be put on international consultation. The original offer from the National Library of Medicine for shared experimentation with the MEDLARS system, between the consortium of European countries operating the national centres, had reached Mr Judge at 4.30 p.m. on 23rd December 1965. The text of the offer had been revised and cleared with the United States delegation and had been in the post, in two languages, to twenty-three countries by midday on the following day. It had been discussed on 4th January 1966 by the Information Policy Group representing nineteen Western countries. The concept had been agreed in principle as something which had been worth very much closer examination. As Mr Judge had explained in his paper, this offer for multilateral experimentation had not in fact given rise to multilateral operation. One of the reasons which he had suggested in his paper for this had been simply that countries which were entering into international co-operation—not all of them starting at the same place and with the same possibilities—had to catch up as best they could. The problems of contributing to international activity started in the particular countries involved. Inevitably much time was taken up in getting things moving and it was a fortunate system that could start off and develop effectively, by a series of bilaterals or oligolaterals, into full operation. The meteorological discipline of Mr Craddock's seemed to Mr Judge to be very fortunate because the pioneering work of Rigby in obtaining international co-operation in data exchange had brought about the situation in many countries where the kind of project, which included the use of a powerful computer, as Mr Craddock had described, could be put into practice.

DR BARRETT said that it seemed to him that one *had* to have international activity. What one should not allow, however, was for such international activity to slow up too much while it looked after the dullest boy in the class. As he had said in his paper, what was needed was the interlocking of national and national/international planning. There had to be some movement in certain countries which allowed a full international position to be established at some time or other. But we should not let this halt the progress of the system development and the computerized development which was necessary. We could not afford all countries in the world to have inputs into the development of a system. Otherwise we would achieve nothing. It was difficult to think of examples of such developments which had happened in the world which had not been generated in the first place by intense national effort. The political problem was to harness the national for the international good.

THE CHAIRMAN agreed with Dr Barrett. The Chairman had found during his last fifteen years of involvement in a fair amount of intense scientific activity that it really did take ten times as long to get things done internationally as nationally. It was always better to begin with a few people working together than with a multilateral large number.

Afternoon session

DR H. COBLANS (Independent) said that, as one who had been sent out on a technical assistance mission, he could entirely bear out every word that Lord Ritchie-Calder had said concerning the errors which had been made over technical assistance in developing countries. He had been sent to Brazil for eighteen months, which they had thought at the time was the correct thing to do. We should realize today however—especially since a great deal of money was being spent by Britain today through the Technical Assistance Board—that those methods had not proved to be successful, for some of the reasons which had been given by Lord Ritchie-Calder. One unfortunate mistake which had been made over technical assistance had been the idea that every developing country knew exactly what it wanted. If, for example, it asked for an ultra microscope, it was not for Unesco, who had to provide the money from a central fund, to question whether this was good or bad. This had been an entirely wrong attitude, especially as South American countries had tended to value the possession of say, an ultra microscope, mainly for prestige purposes.

We realized today that this was quite wrong but we did not have very much to put in its place. We had made other mistakes too: we had spent a great deal of money training people, but what had happened in Brazil, for example, was that during the last two years about forty to fifty distinguished scientists, mainly in the fields of physics, mathematics and biology, had been removed from their posts. Many of these people had earlier won Unesco scholarships to train in France, England and the United States, but now that they had been removed from their posts, all the money spent on their training had been wasted, in terms of the loss to the developing countries. Turning to what Mr Smith had said, Dr Coblans said he had been Chairman of a sub-committee of UNISIST dealing with developing countries. The sub-committee had particularly stressed that any money sent out to develop a particular country was not money well spent. This money had been used properly to begin with, financing new organizations, documentation centres (Unesco had set up twenty-four), but after a few years, when they had been handed over to local governments, they had simply disappeared in some cases or had not been properly maintained. The sub-committee had then moved to the view, which related to what Lord Ritchie-Calder, had said, that if we were going to spend money it must be on a regional basis in areas which could not help themselves, and the whole of this institute must be internationally financed and run by international staff, not by local staff. It was only after people were trained that the local country could take over and run the institute itself. Anything else was really a waste of money, as had been borne out in actual practice.

Dr Coblans went on to say that delegates to the conference may have come across some of the problems with regard to MEDLARS, which had been raised in the morning session. MEDLARS was concerned to provide its services in developing countries, above all in South America. But it had been realized wisely that the tapes could not be given to any one country in South America, because, on the one hand, there would be no assurance that one country would exploit the tapes properly, and, above all, because the service would only serve this one country and not the whole region. What the National Library of Medicine had done, therefore, was to set up an international institute in Brazil staffed mainly by internationally recruited staff, and it was to continue to finance this institute so long as those countries in South America, who could not run their own services as we were trying to do, needed these tape services. This approach was the one which, in the long run, seemed to be the most effective; but this was one of the major problems which UNISIST would have to solve. For, as we had heard from Lord Ritchie-Calder, we could not sit back and allow the large gap between the 'have' and the 'have-not' countries to increase. Although what Lord Ritchie-Calder had said may have seemed to have deviated from the main problems of documentation, it was in fact entirely relevant to our concerns since this was a conference on *international* documentation.

MR A. J. DICKSON (Ealing Technical College) asked Mr Smith if the UNISIST paper on classification chaired by J. C. Gardin was related to Gardin's archaeologically-based classification SYNTOL. MR SMITH said that the report which Gardin had written for UNISIST had nothing to do with his work in archaeology or his interest in language or linguistics. The report was essentially an account of the activities undertaken by the various working groups and the advisory committee working on this project. MR DICKSON then asked Dr Sviridov if there was any school for documentalists/librarians engaged in teaching linguistics, lexicography, or terminology. DR SVIRIDOV replied that he could not name any particular training school where special attention is given to these subjects. He did, however, refer to the *Worldwide guide to training facilities for information and documentation work*, the latest edition of which was to appear shortly. Dr Sviridov also took this opportunity to mention the current discussions by some sections of the FID on the feasibility of setting up some form of International Academy of Information Science or to set up a number of Summer Schools for improving the qualifications of those who teach documentation.

MR A. E. CAWKELL (Institute for Scientific Information, Europe) said that only one speaker had mentioned, in passing, any of the 'for-profit' information services. This seemed to Mr Cawkell symptomatic of so-called international developments. Many excellent internationally-used information services received no mention on these occasions. It was not Mr Cawkell's intention to rectify that omission here, but rather to draw attention to certain attitudes which might receive the attention of the establishment. He then quoted from the SATCOM report (page 10): 'The unique attribute of the *private for-profit organizations* in the fulfilment of their equally vital role in the communication of scientific and technical information is that their survival and growth depend directly on their ability to recognize, understand, and adequately serve users' needs'. In short they had rather strong incentives. Services of no appeal to users could not be sold. The supplier must provide services which were wanted—not subsidized services which he thought people needed—otherwise he would fail. This led Mr Cawkell to his second point, and he again quoted SATCOM: 'Policies usually are formulated by members of the scientific and technical community who, for the most part, have rejected the view that information must be marketed. The general belief is that, if the information is valuable the people for whom it is intended will find it. In fact there is little basis for such a belief.' He thought that an abhorrence of the word 'sales', and its connotations, was at the root of this attitude. It was interesting to assess the attitude of some audiences when he was lecturing. He believed that they sometimes thought that he was there solely to sell them something—a rather unsophisticated view. The same audience would reverentially receive the words of an academic assuming, not necessarily correctly, that he could not be 'sales' motivated. At other places 'sales' was not considered to be unrespectable; the private sector had initiated some very interesting services; there could, he said, be a mutual benefit. The aims of the American Information Industry Association could be found on page 155 of the SATCOM report. An organization with similar aims was being set up in this country.

MR G. LEA (Lea Associates Ltd) elaborated on Mr Cawkell's last point by saying that an association called the Information Services Association was being set up in the UK to be a professional organization of scientific and technical information services operating in Britain. Its members would co-operate in areas of mutual interest by holding meetings, arranging representation at exhibitions where possible, and protecting the interests of members. A Steering Committee had been formed and further details would be widely circulated in the next few weeks. The ISA would emphasize on-going services and the information industry's efficiency in setting up and running information services.

DR W. E. BATTEN (UKCIS) said that it was evident from the reception that most speakers had received that there was much goodwill towards the idea of not only international and national co-operation, but also of inter-organizational co-operation, for the easing of both the financial and the work burdens concerning progress in the field of scientific information services. However, there was always a danger of expending enthusiasm in the wrong directions. There was neither a shortage of pregnant topics to be discussed, nor of formally constituted bodies within which such discussion could take place; and one should be wary of setting up yet further bodies which generate yet further reports. What we did lack, however, was effective machinery for communication between, for example, the three or four technically competent people who had thrashed out a question and who had reached positive conclusions about the direction in which progress on this topic should be made, and the body or bodies that could take these propositions and make them viable through financial and organizational support.

MR JUDGE said that, as he had mentioned in his paper, one of the problems of the 'national focus' was that the area of responsibility of government co-ordination bodies differed widely from country to country. This was particularly so in the US where one had the example of the Information Industry Association mentioned by Mr Cawkell. The main co-ordinating body in the US was COSATI which was set up primarily to co-ordinate the work in the information field of the large federal agencies. But in doing this it automatically excluded the co-ordination of the interests of, on the one hand, the scientific societies, and, on the other, the information industry. Largely as a result of this historical accident, there had come into being, on the one hand, as a result of SATCOM, a joint commission of the National Academies of Science and Engineering to co-ordinate the information interests of the professional societies, and on the other hand, the Information Industry Association to look after the interests of the 'for-profit' sector. It was necessary therefore for all these different bodies to come together. This was a problem which was being studied closely in the intergovernmental work of OECD. Mr Judge thought that the government national focus should give the opportunity for a single common focus so that there could be genuine co-ordination for effective information initiatives wherever they arose.

DR J. G. PEACHEY (Commonwealth Agricultural Bureaux) said that the word 'knowledge' had reached the back of the hall once or twice almost as a substitute for the word 'information'. He thought that one of the most fruitful by-products of the feasibility of a world system would be that it would force both ourselves and the primary authors to reconsider the organization of knowledge. In this connection, it was perhaps sad to think that, in terms of vocabulary control, thesaurus, synonyms and pinpointing of minor variations, the West Indian, the American, the European or the African could all order a 'coke' by using the name 'coca-cola' or 'coke' and could receive it, or a closely related variant, in many different languages with no trouble at all. This simply proved that feasibility here was related to motivation: we had in our normal media an entirely different way in which information was communicated to people through television. We no longer had to struggle with inadequate optical readers. It was well to remember that these techniques of presentation and of standardization were well ahead of our own and until we had caught up with these, we would not really make much progress at all.

DR A. J. EVANS (Loughborough University of Technology) said that we should perhaps be doing something about the crude raw material we were trying to put into information systems (i.e. by refereeing, avoiding duplication, etc.). Hopefully by educating the users (e.g. particularly at undergraduate level), we could help the future scientists and technologists to improve their output. Courses of lectures on communications, for example, might also help.

THE CHAIRMAN agreed with Dr Evans's comments and said that, with reference to the quality of the primary material, as far as he was concerned, a great deal of it should not be published at all and that those people who wrote it should first of all be taught how to write it. This involved many things such as using the refereeing system, stopping unscrupulous commercial publishers from publishing too much, and so on; though our efforts here were not altogether successful.

MR J. M. CRADDOCK (Meteorological Office) said that on the question of the quality of information published, it would be desirable if referees of scientific journals had a 'yes/no' list of headings of originality, which would (a) help the editor to decide whether to publish the paper or not, and (b) serve for classification purposes to enable potential users to judge whether they wished to retrieve it. Suitable headings could include: mathematical content; theoretical control in subject; computational method; computational technique; basic data; new combinations of data; novelty of presentation; and review. The presence or absence of any heading could be indicated by one binary digit in a way well adapted to computer search.

MISS FIONA MACKAY PICKEN (St George's Hospital Medical School), referring to Mr Craddock's comments on the quality of material published, said that the articles in the critical review journals of the medical profession tended to be seen as more and more important by members of the profession, since this was a means by which the unoriginal, unwanted material could be weeded out. Another factor of importance to the medical profession was that the refereeing system did not seem to be very effective. If someone really wanted to publish a paper, it would always be published by someone somewhere, no matter how bad the material was.

MR S. FRANCIS (North-Western Polytechnic School of Librarianship) asked Mr Judge if the OECD had any power or influence to increase the standing of the 'national foci' for scientific information.

MR JUDGE said that OECD was less important as an organization than as a place where its member countries could meet. The word 'focus' in 'national focus' was used deliberately when the phrase was made up, since OECD intended to focus the efforts not just of government but of all the initiatives which were being co-ordinated at that time. National foci had to develop their operations not only as a function of their own abilities but as a function of the dynamism in the particular country. OSTI, for example, was worth a great deal more when it was given more support from this country. The same was true of the other national foci.

THE CHAIRMAN said it would be very wrong to refer to OECD as a 'talking shop'. But it would also be disastrous if it had any *real* power to wield over these national foci.

MR P. F. COLE (BP) said that underlying all the papers presented appeared to be the assumption that international co-operation and exchange of information was the monopoly of either intergovernmental agencies or of prestigious international organizations designed to work through the national foci. He wondered whether any thought had been given to an alternative pattern of international information exchange based upon mission-oriented foci in each of the participating countries. He said that the prestigious international organizations were in fact interfaces, and as such they could either facilitate a transference of something across the interface or they could impede it. Past experience of these organizations tended to indicate that their chance of impeding it was at least as good as their chance of facilitating it. Industry, he thought, had done as much for developing countries as these organizations devoted to direct aid. This was particularly so with the petroleum industry since, in every country in which the petroleum industry operated, it increased the economic strength of that country. He doubted whether some of the direct aid organizations could say as much.

* * *

MR J. S. RIPPON (The Metal Box Co Ltd) submitted, after the conference, the following revised contribution to the afternoon discussion session:

'Those who are working at national and international level to promote more effective communication of scientific information must pay close attention to the requirements of the information practitioners at the periphery who act as transfer agents between the systems moulded by high level negotiation and the ultimate users of information.

Care must be taken to ensure that, for the sake of achieving multilateral agreements and universally acceptable standards, efficiency is not sacrificed to expediency. It can happen, for instance, that well-established but outmoded systems such as UDC are perpetuated unnecessarily or stretched beyond their capabilities or, alternatively, that fashionable but less soundly based approaches may be adopted leading, perhaps, to misapplication of expensive hardware.

On the other hand, a primary aim must be to avoid wasteful and costly duplication of effort both in the development of new information handling techniques and in the marketing of overlapping or incompatible systems. Independent and uncoordinated enterprise in this area may well be a cause of prohibitively high costs to the user.

Moderately large industrial information units like my own find it difficult to afford all the tools that are available to help us in serving our users. Considerable costs could be incurred not only in buying into the needed systems and services but also in converting incompatible data bases, modifying computer programs, acquiring additional specialized hardware, achieving compatibility with our existing systems and in finding and training the extra skilled staff needed to make full use of these tools.

Use of central processing facilities, data banks, information analysis centres and other specialized services may afford some relief. However, this can still be extremely expensive and, because it involves services remote from the user which can seldom be fully in tune with his needs, the results are sometimes disappointing.

Central services should by all means be run on a sound commercial basis; otherwise, like some promising ventures of this kind as well as poorly conceived ones, they will either perish or fail to reach their full potential. Well-conducted pilot market surveys, feasibility studies and cost–benefit assessments are, therefore, a prerequisite to the initiation of new services. Such studies should be supported at national and international level. Internationally organized guidance and encouragement can do much to stimulate the rational development of economically viable services which can be marketed at acceptable prices.

Lord Ritchie-Calder has suggested that we should try investing knowledge in an attempt to solve some of the world's most pressing problems before it is too late. He also stresses the need to invest in human resources. While the need for highly qualified information scientists to pursue research and systems development is well recognized, the crucial but less spectacular role of the information transfer agent in industry, education and government has, I believe, been given far less prominence than it deserves. The importance of having a sufficient number of suitably trained information specialists to mediate between the systems and the users is by no means universally recognized.

There is ample evidence to suggest that scientists, engineers and managers seldom have the time, the desire or the skill to gather more than a small part of the information they need even when they have direct access to the requisite sources. Therefore, investment in central services, in hardware and systems will not by itself result in effective and profitable communication. International planning of educational programmes—such as the excellent efforts of FID referred to by Dr Sviridov—must aim at producing more information specialists who are capable not only of retrieving information but also of distilling out relevant facts, data, ideas, opinions, trends, recommendations and other forms of knowledge and of communicating these graphically or orally so that they are not just understood but actively exploited.

Practising information specialists must, therefore, be encouraged to play a bigger part in education (both of students of information science and of the users) and in helping to guide national, international and professional bodies in shaping future developments in scientific information services.'

* * *

MR E. J. FRENCH (Welding Institute) was unable to be present at the discussion session but submitted the following written contribution after the conference:

'In his paper Dr Barrett mentions the advantages of decentralized input to an information service and Mr Smith also referred to this point in his presentation. Since 1949 the International Institute of Welding has produced a bilingual

(English and French) abstract journal entitled *The Bibliographical Bulletin for Welding and Allied Processes*. Each of the 32 national delegates to the IIW Commission responsible for documentation is given the task of providing abstracts of welding literature appearing in his own country. Experience has shown that there is a limit to such voluntary co-operation. Regular contributions are not received from all countries and the central organization in Paris has to be prepared to step into the breach when necessary. All countries were originally requested to provide abstracts in English *and* French—those contributing seem prepared to do so in one of these languages but not in both. Even then the standard of English or French is often not good enough for publication and editing is necessary. Attempts to persuade contributors to index abstracts according to the IIW classification system were completely unsuccessful and this task is now performed by the central organization. Although the IIW system is not yet computer-based it may nevertheless be worth mentioning as an example of international co-operation in documentation which has continued reasonably successfully for more than twenty years. I say not yet computer-based because a Working Group, on which I serve as UK Delegate, is now reviewing the methods of presentation and types of index required in the light of modern techniques and the requirements of users in the member countries.

On a different note, I consider Mr Judge's reference to Information Analysis Centres to be most timely. The weight of information is not nearly as oppressive as the weight of paper in which it is presented. Perhaps this is particularly the case in a technology such as welding with ramifications extending over a wide field of industry. The same item of information may appear in many different forms and places. Has anyone ever attempted to assess the degree of repetition that occurs in the literature of a technology? The IAC offers some sort of a solution; teams of information scientists with subject specialists could in time reduce things to manageable proportions, so let us get started on this side of the Atlantic. Every year we delay the problem becomes worse.'

Letter to the Editor

Dear Sir,

INFORMATION TRANSMISSION BY LECTURE SLIDES

Is it not reasonable for lecture and conference organizers to arrange for the information that they may wish to convey to an audience by slides to be clearly visible to that audience? Why is it that, on so many occasions, people who are acknowledged experts in some aspect of the subject give little consideration to this particular aspect of information transmission?

There seem to be three points that need attention:

1. Screen size.
2. Type and positioning of projector.
3. Size of data on slides.

The lecturer's dilemma is whether he should put the 20 lines of data that he needs on to the slide, risking unreadability for half the audience, or should he cut the slide to an inadequate 10 lines, only to find upon arrival that the 20-line message he needed could have been seen easily by the whole audience?

In average circumstances, both lecturers and organizers should compromise. A lecturer should not pack a slide with masses of small data (unless he wishes to convey an impression rather than a message). An organizer should provide the largest possible screen and arrange that the lens of the projector and its distance from the screen are such that the whole screen area is used.

A further improvement is to use a zoom lens, available for several good projectors at a price certainly within the budget of most organizations. The organizer then becomes free to place the projector where he likes, knowing that the screen can be filled.

Finally it should be possible for a projector to be developed which gives all concerned complete freedom of action (manufacturers please note). One might expect to find this relatively expensive device in modern, well-equipped lecture theatres. It should embody the following features:

A. Remotely controlled slide changing.
B. Remotely controlled focusing.
C. Remotely controlled zoom lens.
D. Remotely controlled centring of any part of the slide.

A and B are available now.

Most existing zoom lenses are pre-set. C is only required if D is also fitted. Their use together permits a lecturer to move any part of a slide to a central position and blow it up large enough for the whole audience to see it.

A lecturer could show, for example, a system block diagram, and then select any block for examination of the detail contained within it.

Yours faithfully,

A. E. CAWKELL
Senior Consultant

Institute for Scientific Information (Europe),
132 High Street,
Uxbridge,
Middlesex.

15th June 1970

CURRENT AWARENESS LIST

Recent additions to the Aslib library catalogue are broken down into twelve broad groups, whose coverage is indicated below. These groups are not mutually exclusive but it is hoped that users will find them helpful in scanning for new items of interest.

Note: These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory.

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres; management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

JANET WALKLEY
Librarian

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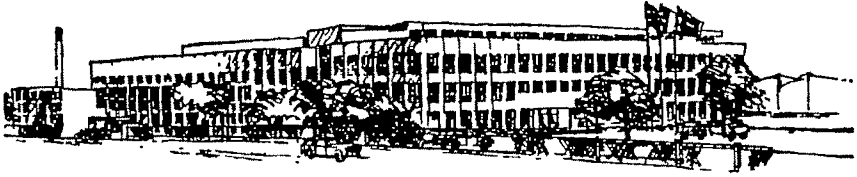

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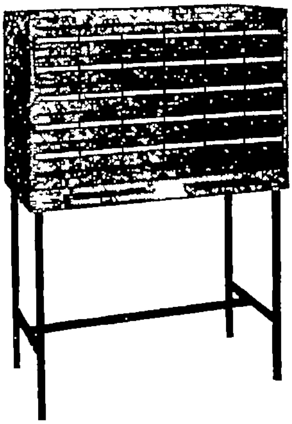

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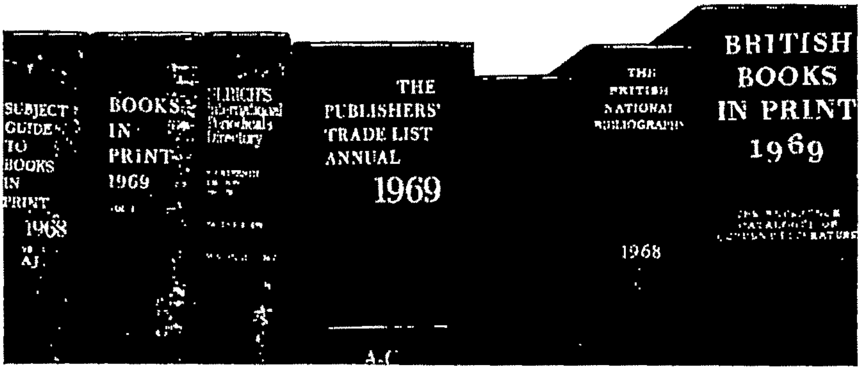
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BOOKS IN PRINT 1969
ULRICH'S International Periodicals Directory
THE PUBLISHERS' TRADE LIST ANNUAL 1969
THE BRITISH NATIONAL BIBLIOGRAPHY 1968
BRITISH BOOKS IN PRINT 1969

ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 22 September 1970 Number 9

ASLIB CALENDAR 1970

October

THU. 1.	Economics Group Evening Meeting and Lecture. Aslib. 5 for 5.30 p.m.
FRI. 2.	Audio-Visual Group one-day meeting with invited members of other audio-visual organizations. Aslib.
WED. 14.	Biological Group Annual General Meeting. Nature Conservancy, 19, Belgrave Square, SW1. 12 noon.
MON. 19.	Co-ordinate Indexing Group Meeting and Lecture: 'Handling generic posting'. Aslib. 3.30 p.m.
TUE. 20.	Computer Applications Group Circulation Working Party. One-day symposium: 'Computer-aided systems'.
WED. 21.	Aslib/Institute of Information Scientists Joint Evening Meeting. 'OR man looks at IR', by W. T. Bane (IPC New Enterprises). Imperial College, London. 5 for 5.30 p.m.
FRI. 23.	Technical Translation Group Meeting and Lecture by Miss M. T. Ward (SE Gas Board). 3 p.m.
MON. 26.	Social Sciences Group Evening Meeting: 'The organization and provision of social science material in libraries'. Aslib. 5 for 5.30 p.m.

November

WED. 4.	Aslib Transport Group/LA Reference, Special and Information Section joint one-day meeting: 'Tracking down transport information.' Library Association, 7 Ridgmount Street, WC1.
MON. 16-WED. 18.	Audio-Visual Group Workshop. Aslib.
THU. 19.	Chemical Group. One-day conference. Quaglino's, London.
	Co-ordinate Indexing Group Meeting and Lecture: 'Use of sub-codes'. Aslib.
FRI. 20.	Technical Translation Group Meeting: Followed by: 'A linguistic approach to technical translation', by P. P. Newark (Holborn College). Annual sherry party. Aslib. 3 p.m.
WED. 25.	Aslib Evening Meeting. 'The archives of 20th century scientists and technologists'. Speakers: Professor N. Kurti, FRS, Mrs M. Gowing and Miss J.M. Pye. Imperial College, London. 5 for 5.30 p.m.

Archives of twentieth century scientists and technologists

At an Aslib evening meeting to be held at the Imperial College of Science and Technology, London, on 25th November 1970, Professor N. Kurti, FRS, Professor of Physics, Clarendon Laboratory, University of Oxford, with Mrs M. M. Gowing (UKAEA) and Miss J. M. Pye (AERE, Harwell), will speak on the archives of twentieth century scientists and technologists.

Until recently few people bothered about the papers of distinguished contemporary scientists and engineers—partly because historians of science and technology have not hitherto concerned themselves much with twentieth century science. Since historians and social scientists will certainly and increasingly wish to study the science and technology that have dominated the twentieth century, it is essential to ensure that the papers they need will be preserved.

The investigation of this problem was one of the principal activities of the Joint Standing Committee on Scientific and Technological Records set up in 1966 by the Royal Society and the Historical Manuscripts Commission. The committee commissioned a pilot survey of the papers of three distinguished scientists from different branches of science who had recently died. The survey had two objectives. The first was to see whether there was a problem—that is whether the scientists' widows who held the papers knew what to do with them. The second objective was to estimate the labour and space required to sort and preserve such collections. The answer to the first question was that the problem was very real indeed and the answer to the second was that requirements of space and labour would be modest. The results of the survey were exhibited and discussed at a meeting at the Royal Society in 1969, and since then the Royal Society-Historical Manuscripts Commission committee has concentrated on finding the necessary finance for a permanent scheme of sorting and preservation.

The meeting will take place in the Mechanical Engineering Department, Lecture Theatre 'C', and will begin at 5.30 p.m. (tea 5 p.m.)

Translation services at Aslib

Some of our members have commented recently that they have commissioned or completed translations only to discover, too late, that the same article was in process of translation elsewhere. The Translations Department of Aslib wishes to remind users that the Commonwealth Index of Unpublished Translations is designed to help them avoid the frustrations and expense consequent on such duplication.

Details of unsuccessful requests are filed in the Index and remain there for a year; where enquirers indicate a possible decision to undertake the translation themselves, this information is also recorded in the Index, and in both cases subsequent enquirers are put in touch with the original enquirer, so that they may come to some mutually beneficial arrangement. Anonymity for those members desiring it will of course be maintained. It is desirable, therefore, that enquirers check with the Index *before* deciding to commission translations.

You can help to make The Commonwealth Index of Unpublished Translations even more effective by sending details of any translations which you have made and are willing to make available. The Translations Department is always happy to discuss any problems or queries you may have.

Editorial Board—*Journal of Documentation*

At its last meeting (23rd July) the Editorial Board was presided over by its new Chairman, Mr B. C. Brookes, Reader in Information Studies, University College London. He succeeds Mr A. Graham Mackenzie, Librarian of the University of Lancaster, who has been Chairman during the past five years. During his period of office Mr Mackenzie has guided the Board in a rapidly changing situation arising partly from the impact on the literature of the use of the computer in documentation, and partly from the larger flow of articles from beyond the United Kingdom.

Aslib is grateful to Mr Mackenzie for his devotion in the past and pleased that he has agreed to continue to serve as a Member of the Board. Thus in welcoming our new Chairman, we need not bid farewell to his predecessor.

Tracking down transport information

The Aslib Transport Group and the Reference, Special and Information Section of the Library Association are to hold a one-day conference on various aspects of transport information presented from a user's, a publisher's, an archivist's, and several librarians' points of view, at the Library Association Headquarters, 7 Ridgmount Street, London WC1, on 4th November 1970. Speakers will include D. Bayliss (GLC), Miss I. E. Harvey (British Railways Board), Mrs P. E. Mongar (Road Research Laboratory), Miss A. M. C. Kahn (Ministry of Transport), T. I. Bell (Board of Trade), D. Kennington (GLC), and E. I. Fowkes (British Railways Board).

The conference fee, including morning coffee, lunch, and afternoon tea, is £4.

Further particulars and application forms will be available shortly from Mr J. M. Wood, Library, Bath University of Technology, Claverton Down, Bath BAZ 7AY.

Chemical Group: 'Building for the future'.

A one-day meeting of the Chemical Group will be held on Thursday, 19th November, at Quaglino's, Bury Street, W1.

The objective is to present delegates with an operational outline of the industry, ranging from innovation, through the planning of new plant to construction and the contractor's role.

Sir Frederick Warner will take the chair and speakers are Mr D. Davies (ICI), Mr F. H. C. Podger (Albright & Wilson) and Dr M. Guter (Constructors John Brown Ltd).

Registration forms are available from the Group Secretary, Mr B. Langton, County Technical Librarian, County Library Headquarters, Goldlay Gardens, Chelmsford, Essex.

Biological Group

The Annual General Meeting of the Aslib Biological Group will be held at 12 noon on 14th October, 1970, at the Nature Conservancy, 19 Belgrave Square, London SW1. There will be a visit to the Library there at 11 a.m., and in the afternoon Dr Foreman and Mr Davis of the Nature Conservancy will speak on 'Conservation and Pollution'.

For further details, contact Miss P. Gilbert, British Museum (Natural History), Cromwell Road, London SW7.

Storage and retrieval of biological information

A series of eleven lectures have been arranged by the Linnean Society of London and the Committee on Biological Information, of which Aslib is a member, on the storage and retrieval of biological information. They will be given at the Linnean Society, Burlington House, Piccadilly, London, from 5th October to 14th December 1970. The programme has been widely circulated but should anyone not have seen it or wishes to make further enquiries about the course they should write to Miss P. I. Edwards, Department of Botany, British Museum (Nat. Hist.), London, SW7. (01-589 6323 Ext. 221). The Library Association have awarded this course a credit under their Mature Registration Scheme.

AGARD Lecture Series

Lecture Series 44, recommended by the Technical Information Panel (TIP) and organized by the Consultant and Exchange Programme of AGARD (Advisory Group for Aerospace Research and Development), will consider the subject: 'Scientific and Technological Information. Why? Which? Where? and How?' The series will be presented twice, in Oslo from 2–3 November 1970 and in Rome from 5–6 November 1970.

The purpose of this Lecture Series is to give to the 'users' an overall briefing of the past, current and future 'state-of-the-art' in the field of Information Science and at the same time provide a forum for a broad exchange of views between scientists, engineers, information specialists and management. All lectures will be in English and speakers will be: H. A. Stolk (National Aerospace Laboratory, Amsterdam), M. S. Day (NASA Headquarters, Washington), A. C. Jones (Dept. of National Defence, Ottawa), S. C. Schuler (Ministry of Technology, Orpington, UK), and J. Murdock and G. Simpson (Battelle Memorial Institute, Columbus, USA).

The Lecture Series is open to all interested scientists and engineers from the NATO nations. Further details can be obtained from: Mr R. Howe, Room 505, Mintech Reports Centre, Station Square House, St Mary Cray, Orpington, Kent BR5 3RE. (Tel. Orpington 32111, ext. 20).

Technical Journals for Industry

As announced in the July issue, two further national lists in this series, for Czechoslovakia and Germany, have recently been published. With the publication of these, and of the national list for Thailand, the number of lists of *Technical Journals for Industry* is now eighteen.

Prepared under the auspices of FID/II (Information for Industry), they are obtainable from the FID Secretariat (the main sales address) at Hofweg 7, The Hague, at the following prices: Australia, Brazil, Canada, Czechoslovakia, Denmark, Finland, Indonesia (temporarily out of print), Netherlands, Norway, South Africa, Thailand and Turkey—10 Dutch guilders each; Hungary, Italy, Poland and Sweden—15 Dutch guilders each; France—20 Dutch guilders (temporarily out of print); and Germany—25 Dutch guilders.

Information Systems for Designers

The Design Group of the Department of Mechanical Engineering at Southampton University is organizing a two-day international symposium on 'Information Systems for Designers', to be held at Southampton from 6th-7th July 1971.

A call for papers is currently in circulation. These will be divided into two main areas: (i) experience in the use of established systems, (ii) new methods of collecting and disseminating information. They will cover feed-back of information within a company, establishment of standards and codes of practice, retrieval of data from technical literature and drawings, presentation of design data sheets, and the listing and coding of standard parts.

Synopses of papers, which should be less than 300 words in length, should be forwarded to the Organizing Secretary, Design Group, Department of Mechanical Engineering, The University, Southampton, SO9 5NH, before 1st November 1970.

Reservation forms for delegates will be circulated later in the year. Those interested in being informed should write to the Organizing Secretary for their names to be placed on the mailing list.

UDC for Individual Crops. Forestry. Horticulture

The latest section of the English Full Edition of the Universal Decimal Classification to be published by BSI is BS1000 (633/635) *Individual crops. Forestry. Horticulture.* It covers cereals, grain crops, grasses, roots and fibres, stimulant, sugar, starch, perfume, condiment, oil, dye tanning and medicinal plants. Arboriculture, silviculture, forest engineering, mensuration, management and marketing. Horticulture, vegetable gardening, ornamental gardening.

Copies of BSI 1000 (633/635) may be obtained from the BSI Sales Branch, 101/113 Pentonville Road, London N1 9ND. Price by post 28*s* (24*s* to subscribers).

Dr R.S. Hutton

Members will have heard with great sorrow of the death on 5th August of Dr R. S. Hutton, one of the founders of Aslib, at the age of 93. At the time of Aslib's founding in 1924, he was Director of the British Non-Ferrous Metals Research Association, having previously been a lecturer in electro-metallurgy at Manchester University and subsequently worked in the family business of silver table-ware manufacturers in Sheffield. Later, in 1931, he was appointed the first Goldsmiths' Professor of Metallurgy at Cambridge.

Throughout his long life, Hutton retained his close personal interest in Aslib and helped to further its development with the same sense of urgency and dedication as he tried to assist the growth of constructive national policies with regard to scientific and technical libraries, not least the National Reference Library of Science and Invention. He was President of Aslib from 1942–44 and an Honorary Member until his death. In November 1966, he was entertained by friends and colleagues at Aslib on the occasion of his 90th birthday, and insisted on standing while he gave a full hour's lecture on the early work and achievements of the Association. In recent years, his sight had begun to give trouble, but otherwise he enjoyed remarkably good health, travelling to London regularly for a busy round of meetings. Indeed, at the age of 89, he is known to have raced the Director of Aslib up the main staircase of No. 3 Belgrave Square!

By his death, Aslib and technical libraries have lost a great friend and champion. It is hoped to publish some tributes from his friends and colleagues of Aslib's early days in the next issue of *Aslib Proceedings.*

A warning to members

A member tells us that he has received a number of invoices, or publicity documents with apparent invoice material contained in them, asking for payment for inclusion of entries about his firm in Business Directories and Telephone/Telex Directories. These entries were not ordered by the firm concerned. The documents have usually come from addresses in Germany, Leichtenstein and Switzerland and are 'official-looking'. Subsequently our member heard that a German company had been fined in Germany for fraudulent insertion of entries and misuse of patented titles.

Another ploy which members may be advised to watch is the receipt of an invoice from a firm using a name close to that of a well known and reputable company, so that the recipient may easily be misled into thinking there is a connection between the two.

With the present state of law on 'inertia-selling' in this country, and the doubtful applicability of the Trade Descriptions Act, members are urged to check carefully before paying such invoices, and to report any fraudulent documents they receive to the police: Det. Inspector Partridge, Companies' Fraud Department, New Scotland Yard, London, SW1.

People and Places

Mr P. M. Whiteman, at present Deputy Director of the School of Library and Information Studies, Queen's University, Belfast, has been appointed Director of the School from 1st October, 1970. Mr P. Havard-Williams, University Librarian, who has been Director of the School since its inception, has been appointed a part-time lecturer in the School from 1st October, 1970.

The 'you can ask us anything' Department

An enquiry to the Aslib Information Department was received mid-afternoon recently from one of our industrial members. Information wanted urgently that afternoon: 'Where can someone learn to belly dance?'

BRIEF REVIEWS

COMPUTER USERS' YEAR BOOK 1970. Brighton (Sussex), Computer Users' Year Book, 1970. 517 p. 105*s*.

More than twice the size of last year's edition, the 1970 Year Book is a practical guide to computer facilities in Britain. The expanded 153-page 'Directory of Computer Installations' includes, in addition to the company name and address and computers, time available for rental if any, its cost, and the data processing manager's name. Other valuable chapters are those on data transmission, personnel consultants and registers, job descriptions, salary analyses and courses available.

The Year Book again includes directories of service bureaux, consultants, manufacturers of computers and peripheral equipment as well as suppliers of computer stationery and related articles. The addresses of some relevant professional bodies and government organizations are listed. Three articles by special contributors are short and add little to this useful reference book.

CONN, G. K. T. *and* FOWLER, G. N., *eds*. Essays in physics. Vol. 1, 1970. London, New York, Academic Press, 1970. 164 p. 30*s*. (SBN 12 184801 9).

As the editors say in their preface, the issue of yet another physics journal may require some explanation or even defence. That given is the need to bring together straightforward accounts of ideas and developments from a number of fields of physics so that they are accessible to as large a number of physicists as possible. To this end articles will concentrate on main issues and consolidate advances rather than discuss new results.

Any vehicle which will enable workers in related fields to keep in touch and help to combat the growing fragmentation of physics is to be welcomed and the four articles chosen for the first volume would certainly seem to justify the editors' claims. Two are drawn from solid state physics, one from high energy physics and the fourth from geophysics. All are well constructed summaries of present knowledge in important fields of interest to all physicists.

CURRIE, *Sir* JAMES, *ed*. Professional organisations in the Commonwealth. London, Hutchinson, 1970, for the Commonwealth Foundation. 511 p. 90*s*. (ISBN 0 09 101940 0).

This publication contains a good deal of detailed useful information which is not available in other reference books, but its arrangement will make it difficult to use.

The book is divided into twelve sections each dealing with a profession or group of professions and each section is preceded by a description of how the profession works within the Commonwealth. The editor admits that the choice of section headings has been arbitrarily made but the decision was taken in order to group rather than sub-divide professions. Each chapter is divided alphabetically according to the countries of the Commonwealth but the entries for each country do not appear to be in any order, although after a detailed study it would seem that they are arranged alphabetically by subject catch-word in several separate sequences. The index merely repeats the order of the text.

Headings throughout each section for countries and some indication as to the method of further subdivision would have been of assistance. An alphabetical index by name of body would also have made the book considerably more useful.

It is regretted that the arrangement of this book will make it very difficult for even Librarians and Information Officers to use.

MINISTRY OF PUBLIC BUILDING AND WORKS. Metric bibliography: a selection of the more important material of interest to the construction industry published before 1970. 4th edition. London, MPBW, 1970. 40 p. Free.

This is the new and fully revised fourth edition of *Metric Bibliography* first produced by the Ministry of Public Building and Works in 1968. To keep the publication to a reasonable size, many entries included in earlier versions have been omitted, but a comprehensive collection of references is available through MPBW's Library service; and items in the bibliography which may be found at all MPBW libraries are marked.

The bibliography, which is of books on metrication, is divided into various sections, such as heating and ventilating, mechanical engineering, and architecture under the heading of the Construction Industry, with other sections such as Conversion Tables and Retraining and Education. Within each section the items are arranged alphabetically by author, with selective annotations.

There is an index to authors and organizations, and a contents list of the different sections and sub-sections. This bibliography should fill a fundamental need of anyone connected with metric change within the construction industry.

SCHALIT, MICHAEL, *comp.* Guide to the literature of the sugar industry. An annotated bibliographical guide to the literature on sugar and its manufacture from beet and cane. Amsterdam, London, New York, Elsevier, 1970. 172 p. 65*s*. (SBN 444 40839 8).

The purpose of this book is to provide a guide to the agricultural, economic and technical literature available on cane and beet sugar, and to bring up to date other similar publications.

The contents are divided into twelve sections, each preceded by a short, helpful discussion of the literature cited. Included are publications of the sugar industry associations, American and foreign government publications, and a short chapter on translators and sources of translations, as well as the usual sources of information such as indexes, abstracts and directories. A list of American doctoral dissertations on sugar since 1938 and reports of the Sugar Research Foundation from 1943–53 are contained in the appendixes.

There are indexes to the titles of the publications included, and to authors and organizations. This guide is easily comprehended and will be a useful addition to reference works on the sugar industry.

SHEEHY, EUGENE P. *comp.* Guide to reference books. Eighth edition. Second supplement, 1967–1968. Chicago, American Library Association, 1970. 165 p. $4.00. (ISBN 0 8389 0073 9).

Eugene Sheehy, compiler of this supplement to Winchell's *Guide to Reference Books*, is head of the Reference Department at Columbia University Libraries. The supplement contains some 1,200 entries for reference books which were published during 1967–8. Also included are details of new editions of works already listed and a number of 1965–6 works received too late for inclusion in the first supplement.

As in the first supplement, each entry gives a brief description of the contents of the reference work, plus details of price and of any reviews of the work from five ALA periodicals.

An important feature of the second supplement is the cumulated index which covers both supplements. Cross-references to the first supplement and to the main volume are also given.

THEODORSON, GEORGE A. *and* THEODORSON, ACHILLES G. Modern dictionary of sociology. London, Methuen, 1970. 469 p. 90*s*. (SBN 416 16940 6).

This dictionary of words and expressions commonly used in sociological works was first published in the USA in 1969. Terms are not only defined and explained in reasonable detail but also, where appropriate, their origins and sources are quoted. Thus, included in the dictionary are references to the fields of psychology, anthropology, economics, statistics and political science where they relate to sociological study. There are also cross-references between related terms. As individual sociologists have tended to endow standard expressions with particular meanings, any book such as this one which helps to clarify the rather esoteric literature will be found useful by students and professional sociologists.

SPECIFICATIONS, STANDARDS AND ALLIED PUBLICATIONS FOR UK MILITARY AIRCRAFT*

S. K. REEVES

Ministry of Technology

Paper presented at the Joint Conference of the Northern and Midlands Branches, Keswick, 23rd–25th April 1970

Introduction

THIS IS a large and complex subject and one which cannot be treated comprehensively and in depth in the course of a short lecture such as this. However, an attempt will be made to acquaint you with the main series of specifications and standards which are employed in the UK to shape and govern the design of aerospace vehicles and to say something about their purpose, broad classification and genesis.

Purpose of Specifications

First, let it be said that if it is decided to write a specification, there should be good reason for doing so, and that the resulting specification should justify itself in that sense.

A specification is essentially a means of communicating the needs or intentions of one party to another. It may be a user's description to a designer of his requirements for purpose or duty; or it may be a designer's description to a manufacturer of an embodiment of the user's requirements; or it may be a manufacturer's detailed description to his operator of the components, materials, methods, etc. necessary to achieve the designer's requirements, or it may be a statement by a vendor describing the suitability of his product for a particular purpose. It may, of course, be a combination of some or all of these things.

The nature of the specification will vary, therefore, according to whether it is written primarily from the using, designing, manufacturing or selling aspect. Specifications will also vary according to the type of material or article which is to be covered, ranging from a brief specification for a simple article to a comprehensive specification for a complex assembly.

Government specifications, in general, certainly those produced by Government Departments, take the form of a user or purchaser's description to a designer or manufacturer of his requirements for purpose or duty.

So far as the Armed Forces are concerned, the purpose of issuing Government specifications and standards is to secure the procurement of standardized stores of the requisite quality, and the application of standardized technical procedures by the Services, with a view to achieving economy and efficiency over a very wide field.

It follows from the foregoing that a specification defining the task to be performed, and the standard of performance to be achieved, is required from the inception of the development of an item to production and packaging for delivery, so that all concerned are fully aware of their responsibilities.

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Classification of Specifications

Let us look first at the very broad categories into which specifications can be divided and sub-divided and then at the more important series of specifications, standards and publications. All specifications, with whatever subject they deal, fall into two broad categories: 'General' or 'Particular' Specifications.

General Specifications, as their name implies, lay down general, basic requirements relating to a class of store, for example aircraft, guided weapons, aero-engines, aircraft equipment, telecommunication equipment, heat exchangers, hydraulic pumps, etc. As a general rule, this type of specification lays down basic design, performance and test requirements. Examples of this type are:

(i) Av.P.970—Design Requirements for Service Aircraft
(ii) Av.P.32—Design Requirements for Guided Weapons
(iii) D.Eng.R.D.Specification 2300—General Specification for the Design and Manufacture of Gas Turbine Aero Engines and Jet Pipes
(iv) Engine Design Memoranda
(v) Av.P.24—General Design Requirements for Aircraft Equipment for Service Aircraft
(vi) Defence Specification DEF 5000—General Requirements for Service Telecommunication Equipment
(vii) Defence Specification DEF 1234—General Requirements for Packaging Supplies for the Services

I shall be dealing with some of these specifications in a little more detail later on.

Particular Specifications are specifications which relate to one particular, individual item, whether it be a manufacturing process, a raw material or a piece of equipment. They are based on the relevant General Specifications, and to that extent, they should be in conformity with them. They include requirements which are peculiar to the particular item to which they relate. It should be borne in mind that Particular Specifications, for obvious reasons, always take precedence over General Specifications.

Specifications may broadly be sub-divided into Material, Process, Equipment, Dimensional and Technique Specifications. Material Specifications cover basic raw materials, such as steels, light alloys, packaging materials, paints, etc. Process Specifications cover the manufacturing processes which are applied to the raw materials, such as anodising, cadmium and zinc plating, heat treatment, etc. Equipment Specifications relate to fabricated stores, products, components, or items of equipment; Dimensional Specifications to such engineering features as screw threads, undercuts, splines, hexagon sizes, etc.; and Technique Specifications to such matters as various forms of testing, sampling procedures for inspectional purposes, the assessment of surface texture, etc.

Equipment Specifications may be further sub-divided into Requirements, Development, Production, Performance or Packaging Specifications. These may be defined as follows:

(a) *Requirements Specifications*

In the evolution of a store or item of equipment, this would be the first specification which would be prepared, and would state the requirements of the user in as much detail as is possible at this stage. Any general design requirements with which the item is intended to conform, and any exceptions from those requirements, would be quoted. The specification, or the contract invoking it, would state precisely the extent of the work required, for example the supply of mock-ups, or the preparation of development proposals, including a Development Specification, which could lead to the placing of a Development Contract.

The Requirements Specification would, wherever possible, include requirements relating to such matters as the following. The list is by no means exhaustive, and only includes the more important matters and those most likely to be included:

(i) The environmental conditions in which the store is to be installed, used, manufactured or stored, for example temperature, pressure, humidity, altitude, shock, vibration, dust, salt spray, etc. The specification would stipulate, when applicable, that the store must be capable of withstanding one or more of these environmental conditions in combination and the period for which it must be capable of doing so.

(ii) Compatibility with associated equipment and materials and the effect of the equipment on its environment.

(iii) Conditions of use, that is, the local circumstances under which the store will be used and the type of personnel—skilled or unskilled—who will be using it.

(iv) Power requirements and other supply services which the store will require.

(v) Maintainability requirements, for example the provisions which have to be made for accessibility and for the removal of parts for servicing; the maximum frequency with which servicing may be conducted; the type of tools which may be used; the maximum permissible servicing man-hours per operational hour, etc.

(vi) Basic design requirements—possibly only given in a very general way, perhaps only by stating purpose or function.

(vii) Properties such as strength, certain basic or important dimensions and weight, together with tolerances wherever possible and appropriate.

(viii) Safety standards which must be observed and any special safety features which must be embodied.

(ix) Materials to be used or excluded. It may be necessary to specify certain materials because of their cheapness, ready availability, ease of use in repair work, etc., and to exclude others because they possess undesirable characteristics, such as a tendency to corrode, are difficult to manipulate or because they do not share the advantages just mentioned.

(x) Interchangeability, both functional and dimensional.

(xi) Performance required under specified conditions. These would be of a tentative nature and may have to be modified in the light of what was practical or economic.

(xii) Tests or investigations required, which at this stage would be of a preliminary nature.

(xiii) Test methods, procedures and equipment conforming to recognized standards. Where and by whom tests shall be carried out may also be stipulated.

(xiv) Criteria for judging test success or failure and the interpretation of results, for example percentage of failures to pass the test.

(xv) Useful life, life between overhauls and total life, including methods and criteria for assessing these lives.

(xvi) Reliability, including methods and criteria for assessment. The reliability may be expressed, for example, as the probability of performing as required under specified conditions for a specified time or number of cycles, or as a maximum failure rate, or as a mean time between failures.

(xvii) Protective treatment or finish, including colour, texture or appearance.

(xviii) Certificates and Reports, including details of their nature, by whom they should be certified and to whom they should be rendered.

(b) *Development Specifications*

Such a specification is intended to cover the development of a new item of equipment and the manufacture of Prototype and Development models. It would be a detailed statement of the functional performance to be achieved, the environmental conditions in which the equipment must be capable of operating, the maintainability, reliability and life requirements and the associated tests. It would in fact, include all the basic requirements of the Requirements Specification (expanded and in greater detail) in addition to the following:

(i) A requirement to use standard parts wherever possible, for example those complying with British Standards, Defence Standards, the SDM and SSM series, AGS, AS, etc.
(ii) The Type Test Schedule. This will invariably have been drawn up in collaboration with the designers of the equipment.
(iii) Requirements for the design, development and testing of packaging for the equipment, including compliance with any existing packaging specifications or codes, such as Defence Specification 1234 or Av.P.32 (Design Requirements for Guided Weapons), Ch.705.

A Development Specification would be amended from time to time as it becomes possible to be more specific in the laying down of requirements. A Production Specification can thus be more readily derived from it.

(c) *Production Specifications*

A Production Specification, or a family of related Production Specifications, constitutes the basis for the ordering and acceptance of a Production store, by defining adequately and unambiguously and, when applicable, in conjunction with the relevant drawings, the standards of manufacture and performance to be achieved and maintained in the production of the store.

The Production Specification is, normally, a derivative of the Development Specification, and, in addition to those requirements of the Development Specification which are considered necessary, it would include the following *main* requirements:

(i) Processes of inspection and quality control, necessary to maintain the uniformity of quality of the product, including, where necessary, sampling procedures.
(ii) Stipulations regarding the methods of checking compliance and the interpretation of results.
(iii) The tests to be performed on each store, including details of test methods and equipment to be used
(iv) The Production Quality Tests to be periodically performed on selected samples on a numerical or time basis.
(v) Requirements relating to the Repeat Type Tests to be performed after changes have been made in the design or process of manufacture, for example when equipment, methods, personnel or manufacturing sites are changed.
(vi) A requirement that the store shall be packaged in accordance with the relevant Packing Specification or Services Packing Instruction Sheet.
(vii) Markings on the store itself or on the package.
(viii) Interchangeability checks.
(ix) Requirements regarding assurance of compliance, for example by suppliers' Certificates or other forms of independent certification.

(d) *Packaging Specifications*

Packaging Specifications may be either Development or Production Specifications. Development and Production Specifications for stores normally include requirements for the packaging of the store. When, however, the packaging requirements are complex, or the packaging has to be undertaken by a specialist firm, the requirements are detailed in a separate Packaging Specification, which either calls for the design and development of packaging for the store or lays down the method of packaging a Production store.

A Packaging Specification for the development of packaging would include the following basic requirements:

(i) Requirements for the design of the packaging of the store.
(ii) The tests the package must be capable of withstanding.
(iii) A requirement that the design and testing of the package must conform to existing packaging specifications or codes, such as Defence Specification 1234 or Av.P.32 (Design Requirements for Guided Weapons), Ch.705.
(iv) Any identification or warning markings to be applied to the package.

On completion of the development of packaging, when the method of packaging a Production Store is complex and one of the methods detailed in the basic packaging specification (Defence Specification DEF 1234) are inappropriate, a special Packaging Specification is produced for the purpose, which lays down in detail exactly how the process is to be carried out and the markings which have to be applied to the package. Excellent examples of this type of specification are to be found in a series known as HQPO Packaging Specifications, which are produced by the Electrical Quality Assurance Directorate for electrical and electronic parts.

At this stage also, a Services' Packaging Instruction Sheet (Mintech Form 673 (Revised)) is prepared. This is the overall document which gives the Services and packaging contractors all the details necessary for the packaging of a Production store. It would require packaging to be carried out either in accordance with one of the methods detailed in the basic packaging specification (Defence Specification DEF 1234) or in accordance with a Packaging Specification of the type just mentioned, which has been specially prepared for the purpose. It would also detail any special packaging instructions which had to be observed.

The Production Specification for a store normally calls for packaging to be carried out in accordance with the Services' Packaging Instruction Sheet.

(e) *Performance Specifications*

The term 'Performance Specification' is something of a misnomer, as it would imply that such a specification would only stipulate performance requirements. This is in a loose sense true, as, in all cases, the performance requirements, in the form of tests which have to be successfully passed and the inspectional controls which have to be applied, are very fully laid down, whilst other requirements, such as those relating to materials, protective treatments, marking, packaging, etc., are more briefly specified, but this varies considerably from one specification to another.

Possibly some of the best examples of true Performance Specifications are those to be found in the Defence Specification series, relating to electronic parts, where the requisite tests, their methods of conduct and the results to be achieved, together with the inspectional control requirements are comprehensively defined, and where other requirements are limited to perhaps envelope and interchangeability dimensions, marking and packaging. This permits a certain amount of freedom to proprietary producers to incorporate their own special features or methods of manufacture, whilst safeguarding the purchaser's essential requirements, such as those relating to overall size and shape, interchangeability, functioning, etc. Though less detailed than a Production Specification a Performance Specification is equally viable for the procurement of supplies.

Current Range of Specifications, Standards and Allied Publications

Having seen how specifications may be broadly classified, we should now consider some of the main series of specifications, standards and allied publications which have currency within the Ministry of Defence and the Aviation Group of the Ministry of Technology.

(a) *General Design Requirements Specifications*

The following may, with convenience, be grouped together and dealt with collectively:

(i) *Av.P.970—Design Requirements for Service Aircraft*
(ii) *Av.P.32—Design Requirements for Guided Weapons*
(iii) *Av.P.24—General Design Requirements for Aircraft Equipment for Service Aircraft*
(iv) *D.Eng.R.D.Specification 2300—General Specification for the Design and Manufacture of Gas Turbine Aero Engines and Jet Pipes*
(v) *Engine Design Memoranda*
(vi) *Defence Specification 5000—General Requirements for Service Telecommunication Equipment*

These are all General Specifications which lay down the basic design requirements and recommendations relating to their respective stores and would be invoked, where relevant, in all Particular Specifications. As previously mentioned, however, in the event of any conflict between the requirements of the two specifications, those of the Particular Specification take precedence. The documents, of themselves, are not mandatory, but only become so when invoked by contract.

In *Av.P.970, Av.P.32* and *Av.P.24,* information and recommended practices amplifying the requirements of the publications are given in leaflets immediately following the adjacent chapters. The contents of the leaflets are not mandatory, but there may be occasions when a specification calls up a particular leaflet or a part of it. Designers are expected to make a practice of consulting the leaflets and not to include in their designs any features in conflict with the recommendations of the leaflets, unless there are good reasons for so doing.

Speaking generally, it is the intention that the requirements of these publications are to be interpreted against a background of current engineering knowledge. The publications do not aim at being a compendium of such knowledge which is relevant to their subject, nor are they intended to be books of rules, compliance with which would automatically ensure an efficient store. The guiding principle observed in their compilation has been to confine the contents to requirements and recommendations which experience has shown cannot be ignored without undue risk of loss of efficiency and reliability and as far as possible to obtain uniformity between Design Authorities.

There is a publication, which, though strictly not a specification, is of such importance and so closely allied to some of the publications about which we have just been thinking that I feel I must say a few words about it. I refer to *Av.P.25—Technical Procedure Requirements for Service Aircraft and their Equipment.*

This publication lays down the technical procedural requirements of the Ministry of Technology (Aviation Group) for all aircraft stores for use in the Services and for use by Mintech for experimental or research purposes. It relates to complete aircraft, items of equipment, components, accessories or simple parts, but not to guided weapons, engines and certain engine accessories. The requirements of *Av.P.25* amplify those given in the Particular Specification for the Store, but in the event of any conflict between the requirements of a Particular Specification and those given in this publication the former takes precedence. The aim of the publication is to enable firms who make aircraft and their associated airborne, ground servicing and test equipment to co-operate with Mintech in the development, testing and technical approval of such stores. *Av.P.30—Technical Procedure Requirements for Guided Weapons and their Equipment* serves a similar function in the Guided Weapons field.

There are also technical procedure requirements relating to electronic components and equipments which are contained in a series of Notices known as Technical Procedure Notices (Electronic).

To return now to the more legitimate specifications, there are the following with which I must deal.

(b) *British Standards*

These need no introduction, as they must be well known to all of you.

The two series of British Standards which are of particular concern to MOD and Mintech and their contractors, are the *General Series* and the *Aircraft Materials and Components Series.* The former are identified by a number and the year of publication, and the latter by a number preceded by an issue number and a section identification letter.

The BSI, of course, promulgates other series of Standards, Handbooks, Codes of Practice and miscellaneous publications. The Standards cover an extremely wide field of subjects, including, for example, terms, definitions and symbols; methods of test; specifications for quality, performance or dimensions; and preferred sizes and types. The principles observed in the preparation of British Standards are that they should be in accordance with the needs of industry, should meet a generally recognized demand and should take into account the interests of producers and users alike.

It is government policy always to give preference to British Standards over other series of specifications or standards and not to produce such publications if an existing British Standard will serve or can be officially amended or revised to suit. The Services and Mintech participate in the preparation of British Standards which are of concern to them, and it is encumbent upon their representatives on BSI Committees to see that Service requirements are incorporated in the British Standards whenever possible. The reason for this policy of giving priority to British Standards is to facilitate the meeting of Service requirements from British industrial sources, thereby achieving advantages in delivery time and cost.

Two important aspects of British Standards are that, firstly, they implement international agreements and recommendations to which the UK has subscribed, such as those emanating from the International Organisation for Standardisation and the International Electrotechnical Commission, and, secondly, that they reflect, wherever possible, both military and civil requirements.

(c) *Defence Specifications, Defence Guides and Defence Lists*

This series of publications is now being superseded by Defence Standards about which I shall be speaking in a moment. This process of supersession will obviously take time, and until it is complete, many of these publications will remain current and effective, so that I feel I must say a few words about them.

These are a series of publications which were produced by the Engineering Standards Co-ordinating Committee (ESCC), the Joint Equipment Standards Committee (JESC) and the Joint Electronics Standardization Committee (JLSC) of the Ministry of Defence. The task of replacing these publications by Defence Standards has been assumed by the Defence Material Standardization Committee, Ministry of Defence, which was formed by an amalgamation of the ESCC and JESC and took over some functions from the JLSC.

Defence Specifications cover the standardization of stores and technical procedures. Those numbered DEF 1-999 inclusive were prepared by the ESCC, those from DEF 1000-4499 by the JESC and those numbered DEF 5000 and upwards by the JLSC. Defence Lists tabulate and classify specific types of stores used by the Defence Services and include some used by other Government Departments. Defence Guides are, in effect, codes of practice used by the Defence Services, but to distinguish them from the Codes of Practice published by the British Standards Institution they were designated Defence Guides. When existing or imminent British Standards, Specifications and Codes of Practice did not meet the specialized requirements of the Defence Services, and when a subject was of interest to two or more of those Services, a 'Defence Specification' or 'Defence Guide' was promulgated. A 'Defence List' was prepared when it was agreed that domestic ranges of standard items common to two or more Services were suitable for official adoption as standard ranges of items for use by all three Services. Details of these will be found in the *Ministry of Defence Index of Defence Publications.*

(d) *Standardization Memoranda*

The publications to which I am about to allude are also being slowly superseded by Defence Standards, but, of course, a large number of them will remain in currency for some time until the superseding Defence Standards have been promulgated.

Some of the standards which the Services, MOD and Mintech (Av.Gp.) and their Contractors have to adopt were at one time promulgated as Standardization Design Memoranda and Standard Stores Memoranda. The Director of Standardization (Army) War Office promulgated Standardization Design Memoranda (Land Service) and Standard Stores Memoranda (Land Service)—SDM (L) and SSM(L) for short. The SDM(L) related to engineering and associated practices, abstract or qualitative matters and design criteria, whereas the SSM(L) comprised lists of equipment, stores and components. These two documents are for use by the MOD (Army Department) and the MOD (Air Force Department) in Land Service, that is non-airborne applications, and by Mintech (Av.Gp.) for guided missiles and Land Service applications, for example for the direct purchase of non-aeronautical stores.

The Superintendent of Naval Material Standardization promulgated Standardization Design Memoranda (Naval)—SDM(N) for short—in publication BR 1943. These standards are used by the MOD (Navy Dept.) for applications other than Air Service equipment.

The Controller of Aircraft, Mintech, promulgated Air Service Standardization Design Memoranda—short title SDM(A)—for use in the design of all Air Service equipment for the three Defence Services.

You will have noted that the standards for Land Service application are published in two series—the SDM(L) and the SSM(L)—the former relating to design matters and the latter comprising lists of stores. This distinction is not made in the SDM(N) or the SDM(A) Series, which correspond, in respect of purpose, with SDM(L).

A very important function of these Standardization Memoranda is to give effect to agreements which have been reached in international military standardization organizations such as the Air Standardization Co-ordinating Committee and the NATO Military Agency for Standardization.

(e) *Defence Standards*

When the Directorate of Standardization was established in the Ministry of Defence, on 1st January 1966, with overall responsibility for standardization throughout the entire Defence field, it was decided that that Directorate would promulgate a series of standards, known as Defence Standards, which would eventually supersede the heterogeneous collection of Standards, Specifications, Lists, Guides and Codes of Practice which were being produced by the Service Departments and Mintech (Av.Gp.). These standards are produced in the form of 'Specification', 'List' or 'Guide' type Defence Standards, and are analagous to Defence Specifications, Defence Lists and Defence Guides, which they now supersede and which I mentioned above. They are the means of promulgating the Services requirements for design or performance of equipments or components; for specifying standard ranges of items; and for establishing codes of practice. They are also the means of implementing international military standardization agreements.

Defence Standards are issued under the aegis of the Ministry of Defence and

Mintech (Av.Gp.), though they do not all, in fact, apply to Mintech (Av.Gp.) contracts. Each standard, however, clearly indicates the extent of its applicability.

A large number of these standards have already been promulgated and many more are projected. When it is recalled that Defence Standards will be used throughout the entire Defence field, in all applications, that is Land, Sea or Air, and will supersede a large number of both major and minor series of standards and specifications, it becomes evident that these are now most important publications, and will assume even greater significance as their numbers increase and the older publications are superseded.

(f) *DTD Specifications*

The vast majority of these specifications relate to materials and processes and these are prepared by the materials Division of Mintech, either to meet a limited requirement not covered by an existing British Standard or to serve as a basis for the production of a material, or the control of a process, which is not sufficiently developed to warrant its submission to the BSI for standardization.

A very well known and important member of the DTD family of specification is DTD 900 (Approval Procedure for Proprietary Materials and Processes) which lists all the proprietary materials and processes which have received Mintech (Av.Gp.) approval. It also gives details of how such approval may be obtained and the inspectional control arrangements to which the materials and processes are subject. The manufacturer's specifications for the individual materials and processes are not available to the public as they contain proprietary information, but they are held in confidence by the Branch of the Mintech Materials Division which granted the approval.

A part of the range of DTD Specifications covers aircrew clothing and equipment and miscellaneous aircraft components, whilst a couple relate to climatic tests. Batches of numbers have been allocated to these various groups of specifications for convenience and I shall give you these when dealing with sources of supply.

Speedy preparation and amendment is an advantage of the series. When a DTD Specification becomes stable, and its usage widespread, it is offered to the BSI for standardization.

An offshoot of this series is known as DTD(RDI) Specifications. These are prepared by the Research and Development Branches of Mintech (Av.Gp.) dealing with aircraft and engine systems or installations and their components and accessories. These specify development aims and design requirements in respect of these items.

(g) *Common Valve (CV) and Common Network (CN) Specifications*

These are specifications which were promulgated by the Joint Services Technical Valve Committee, Ministry of Defence, to cover electronic valves, semiconductors and common networks, that is, integrated circuits.

With the introduction of BSI Common Standards under the Burghard Scheme, of which I shall be saying something presently, and of Defence Standards, these specifications will be gradually superseded. There is, however, a considerable number of these which are of importance in the electronics parts field and will continue so until such time as they fall into disuse or are superseded by BSI Common Standards or Defence Standards. Meanwhile, arrangements have been made for their amendment, absorption into other series or cancellation as necessary.

A system of Qualification Approval is associated with these specifications, under which a manufacturer wishing to obtain approval for any of his products, has to submit them to the tests laid down in the specifications. If these prove successful, he is issued with an approval Certificate and a NATO stock number is allocated to the component.

Full information on Joint Service Qualification Approval procedure is contained in Defence Specification DEF-5001. A list of suppliers of Joint Service Qualified Products is given in RCSC Guide RCG4. (Joint Service Qualified Products List of Electronic Parts).

(h) *Radio Components Standardization Committee* (*RCSC*) *Specifications Lists and Guides*

These publications, which took the form of Specifications, Lists or Guides, were issued by the Radio Components Standardization Committee of the JLSC to cover electronic components in general, excluding common valves. Practically all these specifications have now been superseded by the Defence Specification series. Many in their later form have been superseded by Defence Standards, though a few survive in their original form.

(i) *CS and TS Specifications*

These are a very large family of specifications, covering an extremely wide range of non-metallic materials, such as adhesives, chemicals, explosives, lubricants, plastics, rubbers, etc. They are prepared by the Directorate of Chemical Inspection, MOD, primarily for Army use, but some have also been used by the Navy and Air Force. They have no aeronautical application, though some, when converted to Defence Standards, have been amalgamated with the aeronautical DTD Series.

The main series is the CS, this comprises the specifications of those materials, which are fully developed and for which there appears to be a continuing need. The specifications of those materials which do not fulfil these requirements are of a provisional nature, and are placed in the TS Series. They are subsequently either cancelled or transferred to the CS Series. This family of specifications is in the process of being superseded by Defence Standards.

(j) *SBAC Aircraft General Standards* (*AGS*), *Aircraft Standards* (*AS*) *and Reference Sheets*(*RS*)

AGS and AS are both old and well-established series of standards, prepared by technical committees of The Society of British Aerospace Companies Ltd, on which Mintech is represented. They are intended to embrace detail parts and accessories which are widely used throughout the Aviation Industry and are used by Government Departments and the Defence Services.

The AGS were the original aircraft engineering standards; the series dating back to the First World War when standards were prepared in the Government Aircraft Factory, subsequently the Royal Aircraft Establishment, at Farnborough. Responsibility for the series was transferred by the Ministry of Aviation to the SBAC in the 1950s. Although it still contains some non-proprietary standards of long standing, any additions are items which are of a proprietary nature, and which can, therefore, only be manufactured by the owners of the proprietary rights or those to whom they have extended these rights. The AS series are free of any such restrictions and all suppliers are free to manufacture to them. Both series either directly, or indirectly, provide full manufacturing information.

The Reference Sheets are not intended for manufacturing purposes, but provide standardization information of an abstract nature, for example standard abbreviations, standard method of dimensioning turbine blades, the standardization of interfaces, etc.

(k) *Miscellaneous Specifications*

Over the years, the various Branches and Establishments of the Ministry of Defence and Mintech (Av.Gp.) have produced a great variety of specifications which are mainly of local interest, and which, for the most part, have been prepared to meet the specialized needs of the originating authorities. They cover an extremely wide and varied field of subjects, such as materials, processes, procedures and items of equipment. There are about ten thousand of them extant at the present time. Inevitably, in the absence of a co-ordinating authority, they do not form a coherent system, and a certain amount of overlapping and unnecessary proliferation has occurred. For some time now, the Directorate of Standardization, MOD, has had the matter in hand and is making strenuous efforts to prevent new specifications from being unnecessarily raised and to reduce the existing number by their amalgamation and conversion into Defence Standards. To facilitate this process, the Stan 10 Branch of the Directorate of Standardization operates an information and library service for Government Departments, but would, no doubt, be willing to deal with enquiries from government contractors.

Information regarding these specifications and other kindred publications, including their Reference Numbers, the subjects they cover and their sources of supply will be found in the following publications:

(i) *Av.P.970 (Design Requirements for Service Aircraft) Volume 1, Book 1, Table 1*
(ii) *Av.P.24 (General Design Requirements for Aircraft Equipment for Service Aircraft), Introduction, Table 1*
(iii) *Av.P.32 (Design Requirements for Guided Weapons), Leaflet 001/1*
(iv) *Defence Specification DEF—5000 (General Requirements for Service Telecommunication Equipment) Part 1, Section 2*
(v) *Standardization Design Memoranda (Land Service) 166/5—Standards and Specifications*

I must stress that the Aviation Publications mentioned can only be obtained by those who require access to the information for the purpose of HM Government Contracts and not solely for the purpose of gaining information regarding these miscellaneous specifications.

The Genesis of Specifications and Standards

Specifications and standards may originate and evolve in a number of different ways. The original draft of a specification or standard, which is intended to meet a specialized or local need, may be produced by a Government Department or a Government Establishment, such, for example, as the Royal Aircraft Establishment, Farnborough or the Royal Radar Establishment, Malvern. DTD, CS, TS, and the various Departmental Specifications previously mentioned, originated in this way.

Many other series of government specifications and standards, such as Defence, CV, CN and RCS Specifications and some Defence Standards, are, or were, produced by various Committees, such as the ESCC, JESC, and the JLSC of the MOD and their dependent committees such as the Joint Services Technical Valve Committee (TVC) and the Radio Components Standardization Committee (RCSC), for example.

The BSI produces its standards through its numerous Technical Committees, which are widely representative of Government Departments, Industry, Public Authorities and the Defence Services, both as users and producers. In whatever manner the first draft originates, it is circulated for comment as widely as is considered necessary to all Authorities concerned, both within and outside the Public Service. The extent of circulation varies considerably and depends entirely upon the need the specification or standard is to serve. Sometimes, to facilitate preparation, circulation is made in a series of widening circles.

The BSI, as one would suppose, has an extremely wide and elaborate system of circulation and re-circulation, particularly within Industry. Comments received are carefully considered and, if appropriate, are incorporated in a further draft. If the amendments made are numerous or significant, a revised draft is circulated for further comment. This process is continued until the best synthesis of all expressed views has been obtained. Formal acceptance from all authorities is then sought, and when received, the specification or standard is published.

In all cases, the cardinal principle is that specifications and standards must be born of agreement by all who have an interest in the subject.

Mention must be made, if only briefly, of a scheme for the evolution of standards known as the Burghard Scheme, so called after Admiral Burghard who originally suggested it and was later Chairman of the Committee on Common Standards for Electronic Parts which formulated it and recommended its adoption. The Second Report of the Committee was issued in May, 1965, and was accepted by Government Departments, Industry and the BSI in March, 1966.

The Report recommended that the BSI should promulgate a new series of standards for electronic parts known as 'Common Standards', to meet the requirements of as wide a sector of users of these parts as possible, and in a form, and by procedures, acceptable to them. The Report specifically recommended that Common Standards should reflect international agreements, particularly those of the IEC.

It is hoped by this scheme to replace, with BSI Common Standards, the vast majority of the electronic parts standards at present promulgated by the BSI MOD, Mintech, Trade Associations and the GPO. This means that virtually all the existing Defence, CV and CN Specifications will be superseded in time by these Common Standards.

A very important feature of the scheme is that it includes a procedure for the inspectional approval and supervision of manufacturers' inspection organizations and test facilities by an executive agent of the BSI. The Electrical Quality Assurance Directorate of Mintech (Av.Gp.) has been nominated for this purpose. Under the scheme, a manufacturer wishing to obtain approval of an electronic part as conforming to a Common Standard, must subject the part under the supervision of the EQD, to the tests laid down in the specification. If the tests are successfully passed, the part is added to the Qualified Electronic Parts List (QPL), which is maintained by the BSI. Provision is made for obtaining test data cumulatively from standardized batch sampling tests. This test data is available to all users in standard form by a 'Certified Test Record' (CTR) system, from which assessments of performance, uniformity of production, and, to a limited extent, of quality and reliability can be made.

The main advantages of the scheme are that it eliminates a large number of other standards; costs are reduced through mass production and testing; a large amount of test data is effectively and economically obtained; and all users of electronic parts get the same assurance that parts consistently conform to an adequate and known standard.

Copies of the Burghard Report can be obtained from HMSO, whilst the whole scheme is set out in detail in *BS 9000—Specification for General Requirements for Electronic Parts of Assessed Quality*.

The preparation of Government Specifications involves a great deal of collaborative work in the field of international standardization, and the UK plays an effective part in this very important and expanding sphere of activity. The two international organizations with the work of which the UK is most concerned are the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Both bodies are affiliated and have a world-wide national membership. IEC, whilst preserving its autonomy, functions as the Electrical Division of ISO. These two bodies promulgate 'Recommendations', and those which the UK have ratified, it is under an obligation to implement and does so by incorporating their substance in existing or new British Standards.

The BSI represents the UK in all respects on these two international bodies, that is it acts as the UK mouthpiece in all matters; it sends representative delegations to the meetings of their Technical Committees; and, through its own Technical Committees, it formulates and advances UK views, and drafts, amends and criticizes Draft. Recommendations. Further information about these two bodies may be obtained from the *ISO Memento*; the *ISO Catalogue*; the *IEC Catalogue of Publications*; and the *International Electrotechnical Commission: What it is, What it does, How it Works*. All these publications are obtainable from the BSI.

The Defence Services and Mintech (Av.Gp.) are actively engaged in the work of the Air Standardization Co-ordinating Committee (ASCC) and in that of the

Armaments Committee and the Military Agency for Standardization of NATO. ASCC is a Committee of the Air Forces of five English-speaking nations—America, Britain, Canada, Australia and New Zealand and has its Navy and Army counterparts. NATO, of course, requires no introduction. All these organizations are of a purely military character, in which Industry is not directly represented, but is nevertheless, closely consulted by the Government representatives who attend the meetings of their various Working Parties.

These bodies promulgate ASCC Air Standards, ABC Navy Standards and ABCA Army Standards, on the one hand, and NATO Standardization Agreements (STANAGS) on the other. The purpose of such standards is to enable the Services of member nations to work together effectively in time of emergency rather than to standardize actual items of equipment. The standards are binding upon those nations which have ratified them.

Those of these standards which are of a technical, as opposed to an operational nature, are nationally implemented by their requirements being incorporated in Design publications such as Av.P.970, Av.P.32, Av.P.24, etc. or in Defence Standards. Further information about these military standardization bodies will be found in a paper entitled *Military Standards* by W. G. Cousins, which was read to an Aslib Engineering Group conference in April, 1966. Copies of the paper may be obtained from Mintech, TIL/F, Station Square, St Mary Cray, Kent.

Sources of Supply

The various specifications, standards and publications which have been mentioned in this lecture, and certain HMSO publications, may be obtained from the following sources:

(a) *Aviation Publications (Av.Ps)*
Ministry of Technology, OS (P & S) 3 (b), Room 310, 54/57 Drury Lane, London, WC2. The Aviation Publications which have been mentioned are classified 'Restricted' and are only available, therefore, to those who require access to the information for the purpose of HM Government Contracts.

(b) *D Eng RD Specifications*
Ministry of Technology, AX Registry, Room 163, St Giles' Court, 1/13 St Giles' High Street, London WC2.

(c) *Engine Design Memoranda (E.D.Ms)*
Ministry of Technology, CRTOE, Room 153, St Giles' Court, 1/13 St Giles' High Street, London, WC2.

(d) *Technical Procedure Notices for Electronic Equipment*
Ministry of Technology, DLRD(A)/TPR, Castlewood House, 77–91 New Oxford Street, London, WC1.

(e) *CV, CN and RC Specifications and RC Lists and Guides*
Ministry of Technology, TL 5, Room 866, Castlewood House, 77–91 New Oxford Street, London, WC2.

(f) *Defence Specifications*
HMSO

(g) *DTD Specifications*
 (i) Aerospace Materials and Processes Nos. 1–999 and 5000–5999 and Index from HMSO.
 (ii) Aircrew Clothing and Equipment and Miscellaneous Aircraft Components Nos. 1000–1999 (except Nos. 1085–6) from: Ministry of Technology, RDT2, St Giles' Court, 1/13 St Giles' High Street, London, WC2.
 (iii) Climatic Tests Nos. 1085–6 from HMSO.

(h) *CS and TS Specifications*

Ministry of Defence, Army Department, Director of Chemical Inspection, HQ Building, Royal Arsenal, Woolwich, London, SE18.

(i) *HQPO Packaging Specifications*

Electrical Quality Assurance Directorate, 'Aquilla', Golf Road, Bromley, Kent.

(j) *Miscellaneous MOD and Mintech (Av.Gp.) Specifications*

For information regarding the nature of these publications and their sources of supply, reference should be made to the following publications:

(i) *Av.P.970 (Design Requirements for Service Aircraft), Volume 1, Book 1, Table 1*

(ii) *Av.P.24 (General Design Requirements for Aircraft Equipment for Service Aircraft), Introduction, Table 1*

(iii) *Av.P.32 (Design Requirements for Guided Weapons) Leaflet 001/1*

(iv) *Defence Specification DEF—5000 (General Requirements for Service Telecommunication Equipment), Part 1, Section 2*

(v) *Standardization Design Memoranda (Land Service) 166/5—Standards and Specifications*

I must stress once again that the Aviation Publications mentioned can only be obtained by those who require access to the information for the purpose of HM Government Contracts. and not solely for the purpose of gaining information regarding these miscellaneous specifications.

(k) *Standardization Memoranda SDM(A), SDM(L), SDM(N) and SSM(L)*

(i) SDM(A) from:

Ministry of Technology, SAE Records, Room 513, Stuart House, 23–25 Soho Square, London, W1.

(ii) SDM(L), SDM(N) and SSM(L) from:

Ministry of Defence, Directorate of Standardization, First Avenue House, High Holborn, London, WC2.

(l) *Defence Standards*

Ministry of Defence, Directorate of Standardization, First Avenue House, High Holborn, London, WC2.

(m) *British Standards, ISO and IEC Recommendations*

British Standards Institution, Sales Branch, Newton House, 101–113 Pentonville Road, London, N1.

or from the Institution's offices at 2 Park Street, London, W1.

The *British Standards Yearbook* contains full details of the services, including the sales and library services, which the BSI offers. It also lists the British Standards current at the 31st December of the year prior to the year of issue.

A separately published *Supplement to the Yearbook* lists the publications of international standardizing organizations.

BSI News is issued monthly and provides information to keep the Yearbook and its Supplement up to date. It also lists accessions to the library.

A booklet (PD 4845) giving details of the organization and working of the BSI is available from the Institution free of charge.

(n) *SBAC Aircraft General Standards (AGS) and Aircraft Standards (AS)*

The Society of British Aerospace Companies Ltd, 29 King Street, St James', London, SW1.

(o) *HMSO Publications*

HMSO issues the following Reference publications which are of considerable use to librarians:

(i) *Daily List of Government Publications*

This is issued daily—Monday to Friday—and lists the publications which have been published that day. Each list is numbered and dated and gives the titles and prices of all the publications listed.

(ii) *Monthly Catalogue of Government Publications*

The monthly catalogue gives details of the publications which have been published during the month to which it relates, and is thus a compendium of the publications included in the Daily Lists. It includes a loose insert with short descriptions of important publications and is fully indexed. The catalogue is of special value to librarians, many of whom regard it as indispensable for Reference Libraries and for use in selecting material for permanent accessions.

(iii) *Annual Catalogue of Government Publications*
The Annual Catalogue comprises a fully indexed bibliography of all Government Publications issued in the year, except Statutory Instruments. Pagination is continuous for five years, so that five catalogues may be bound together as one consolidated edition. A consolidated index is issued every five years. The most recent edition covers the years 1961–5.

(iv) *Sectional List of Government Publications*
These are lists of Government publications arranged according to the Government Departments sponsoring them. About forty-five of these lists are now available. When complete, the series will comprise a catalogue of all current non-parliamentary publications, with a selection of important parliamentary publications. All the lists are brought up to date periodically. Issue is free to applicants. All these publications may be obtained from HMSO or through any bookseller.

Conclusion

In conclusion, may I express the hope that my paper has not proved too arid, but that on the contrary it may have served a useful purpose. Of the importance of the subject to us in Mintech and MOD, however, there can be no question.

METRICATION IN SPECIAL LIBRARIES

M. J. B. JONES

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Paper presented at the Joint Conference of the Northern and Midlands Branches, Keswick, 23rd–25th April 1970

THE METRICATION programme in the United Kingdom is now sufficiently advanced for an attempt to be made to separate fact from propaganda, and practicalities from wishful thinking.

Anyone who has been engaged in handling technical information is well aware that Britain has been 'bi-lingual' in weights, measures, and technical units, for many years. This situation will continue for at least a generation, though with an increasing emphasis on metric units as the primary system. The reason for this conclusion is that the metrication exercise is really about international standardization. The standards are fundamental, the units are really only a means to an end.

The economic motivation behind the metrication exercise is variety reduction through adoption of the recommendations of the International Standards Organisation. The reason for the introduction of metric weights and measures is that most ISO recommendations are expressed in metric terms. It therefore makes sense to express ourselves in the same way. The snag, which will prevent a complete changeover, is that some ISO recommendations are based on British or American standards and are expressed in imperial units.

The prospect facing special libraries is, therefore, one of increasing duplication of information for several years, followed by a very gradual falling off in the use of imperial based textbooks, data sheets etc.

It is fortunate, but coincidental, that the metric system is a rather tidier and more elegant system than the imperial system. The metric system has, however, some imperfections and some variants. It will be necessary for information workers to learn to distinguish the variant forms, and to guide enquirers to the particular form required.

Let us survey the various forms of the metric system which are encountered in technical literature. Most physics textbooks are written in 'cgs' units, where the letters stand for centimetre-gramme-second. The physics of electricity and magnestism unfortunately generates three forms of the cgs system:

cgs—electromagnetic units
cgs—electrostatic units
and 'practical' units.

The existence of these three systems even within one textbook has bedevilled teacher, student, and information seeker for many years. There will however be many useful and classic works in technical libraries which contain truths, albeit wrapped in the camouflage referred to above.

Largely because of the difficulties of trying to teach the elegant facts of electromagnetism through the smokescreen of cgs units, Professor Giorgi, of

Rome, proposed an entirely new approach to the metric system. His first results were announced in 1904. Giorgi pointed out that if, instead of the centimetre, the gramme and second, we established the metre, the kilogramme and second; and if in addition we added one electrical unit, all the 'practical' electrical units fitted neatly into the system. The choice of the basic electrical unit is arbitrary but international agreement has been reached on the ampere.

The basic form of the Giorgi system could therefore be called the MKSA or 'metre-kilogramme-second-ampere' system.

Giorgi also made a proposal which tidied up numerous formulae in electrical engineering by 'rationalizing' the system. Rationalization is concerned with removing factors of 4π from formulae where their appearance was illogical. Electrical engineers the world over have been using Giorgi units or 'Rationalized MKSA' units for about twenty years and many good books are available in MKS editions. The units which Britain is adopting in the metric changeover are closely related to MKS units but are a refinement of MKS. The system we shall adopt is known as 'SI' which is short for 'Système International'.

The problem does not end there because yet another variant of the MKS units, known as 'metric-technical' has been commonly used by engineers in the metric world. Most current textbooks, data sheets, specifications etc, emanating from Europe are expressed in metric technical.

The difference between the SI and metric technical unit systems lies in the force unit used. SI uses a 'coherent' force unit, named the newton, symbol N. Metric technical uses a 'gravitational' force unit, named the kilogramme-force, symbol kgf.

Information workers should ensure that they are aware of the unit system used in all the documents they consult, and they sould be able to advise enquirers, and to assist with conversion problems when these arise.

Having outlined the problems confronting us upon our entry into the metric world let us now return to a point mentioned earlier: the existence of international standards in imperial units.

When handling the new British Standards, to which BSI publication PD 6286 *Metric Standards published and in progress* is an invaluable guide, you will note two things. The new standards carry an indication of the unit system used; the BS number and title being followed by M, for metric, or M+I, for metric and inch. The front cover also may bear the legend, printed in red, 'Metric Units'. You will also note that the preamble usually contains some such form of words as 'the tabulated values are completely in accordance with ISO Recommendation R123'.

The British Standards Institution are under an obligation to ensure that the new and revised specifications are compatible with ISO/R documents where these exist.

International Standardization is a two-way traffic to which Britain and America have contributed. To mention a few key examples:

The British Standard Pipe Thread,
The Unified Screw Thread, now re-named 'ISO-Inch',
Rack assemblies for electronic equipment,
Printed circuit board connectors,
are items where inch based standards are used internationally.

It would therefore be a costly mistake to discard information based on imperial standards in the foreseeable future. Do however ensure that you are in a position to give competent advice on the relative status of imperial and metric standards on like topics.

To complete this rather forbidding picture let us turn to the situation in technical publishing. There is to be no financial assistance or encouragement to undertake metrication exercises. The Treasury attitude is summed up in the phrase 'the costs must lie where they fall'. From the point of view of the technical publisher there is no immediate incentive to withdraw a selling title and to reset the text in SI units. The cost of producing an SI edition of certain types of work, such as *Machinery's Handbook,* or *Kempe's Engineers Year Book,* is formidable. The publisher will need to be assured of genuine demand before shouldering such a burden. It therefore seems likely that the wretched and error-prone business of conversion will be with us for a long, long time. For the sake of the desperate enquirer, therefore, acquire a facility and confidence in your handling of conversion factors and conversion tables.

STANDARD COSTING FOR INFORMATION SYSTEMS: BACKGROUND TO A CURRENT STUDY

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Introduction

FOR SOME time past, interest has been developing within the Aslib Research Department in the problems of establishing standard costs for information systems.* A literature search recently conducted by the Department (R. Reynolds[1]) has revealed a scarcity of usable information on this subject: such data as is available is difficult to evaluate comparatively because of the differing definitions of the operations costed and of the terms used to describe them. It would seem, therefore, that a first step towards developing a costing method of widespread application would be the establishment of standard conventions for the analysis of information systems.

One might postulate two possible ways of arriving at comparative costs for these systems, namely:

(a) *General survey method*: The overall costs of a large number of information systems are broken down into a small number of categories, and analysed for correlation (see, for example, C. J. Wessel *et al*[2]).

(b) *In-depth study*: A small number of systems are studied in detail in an attempt to establish the true sources of the costs and factors affecting them.

In a current project, we are attempting to apply method (b) to the production of current-awareness bulletins. An outline of some of the preliminary work in this project follows.

Classification of costs

Helmkamp[8] suggests that an information system be regarded as a manufacturing concern, 'in which the product, information, is developed in various forms during a well-defined production process'. Sizer[3] gives the following basic classification of costs for cost accounting:

Prime expense	*Production overheads*
Direct material	Indirect material
Direct labour	Indirect labour
Direct expenses	Indirect expenses

Sizer distinguishes between direct and indirect costs in the following way: 'One *allocates* direct expenditure which can be directly associated with a cost centre or cost unit, but one *apportions* indirect expenditure'.

From Gilchrist's[4] classification of library systems, we can extract the following costs:

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* Throughout this paper the phrase *information systems* is used in a general sense to include libraries.

Labour

Operational subsystem (cost affected by variables such as layout, form design, document form, equipment form)
Administrative subsystem

Material

Capital equipment costs
Rental of equipment
Equipment running costs
Consumables
Documents

Overheads

To this list must be added the cost of use of outside services (e.g. for printing) which is not included in Gilchrist's classification.

These items fit easily into Sizer's classification, with the exception of documents, which unlike 'materials' in the generally accepted sense, are not consumed by the various processes they undergo. Therefore, we arrive at the following table of costs:

Prime expenses

Documents: including information input from other services
Direct material: Consumables such as blank forms
Direct labour: Operational subsystem
Direct expenses: Cost of use of outside services (e.g. for printing)
Direct equipment costs

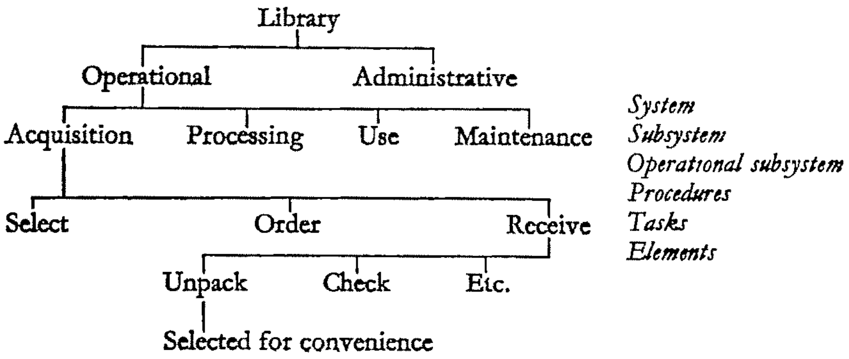
Production overheads

Indirect material: Consumables such as general stationery
Indirect labour: Administrative subsystem
Indirect expenses: Equipment (capital/fixed rental)

Our attention will be concentrated mainly on the problem of direct labour costs in terms of man-hours, but some of the other categories, in particular administrative costs, need further consideration.

Definitions

Following Thomas and East[5] and Gilchrist[6] we regard the library system hierarchically as:



The terminology used in the above table is based on Institute of Office Management (IOM) definitions, and has mainly been applied to physical and clerical operations. However, a characteristic feature of libraries is the interweaving of intellectual and clerical operations and this creates problems in the application of this terminology to information systems, particularly at the task level and below.

For comparative costing, we consider it necessary to define within the hierarchy a standard level of widespread application, so that the operations on this level can be assigned standard times. Previous study has shown that the level chosen should as far as possible satisfy the following conditions:

1. Only one person should be involved in the operation.
2. The variables affecting the time taken for an operation in varying environments should be easily identifiable.
3. The beginning and end point of the operation should be easily observable.
4. The end product of the operation should be identifiable.

Points 1 and 2 require that the operation should be below the procedural level (see for example the eighteen library procedures of Thomas and East[5]). Points 3 and 4 define a minimal level, above the element level for operations with some intellectual content. The operations satisfying these conditions which we have called TASKS are equivalent to the clerical tasks as defined by IOM.

In practice, the beginning and end points are in some sense superficial, and may depend on the practice of the individual performing the task. Therefore, the aim has been to provide:

(a) A list of tasks capable of building up notional systems, but not necessarily sufficient for describing a real system.
(b) A framework for describing tasks which may emerge during the examination of real systems.

One problem in the definition of tasks is deciding how specifically they should be defined. For example 'Enter' is a very general task covering all operations in which information is recorded, ranging from simple, as in 'Copy', to complex, as in 'Abstract'. One might decide to use the specific word in each case, but this still would not be sufficient to identify the various factors involved, and therefore explain exactly the time taken to perform the task in a given instance. Thus, the time taken to 'Copy' will depend on the amount of information recorded, the sources consulted for this information, and the intellectual effort involved. The problem, therefore, is the identification of these variables. Given a method for taking these variables into consideration, the specificity of the task-names is not of primary importance, and so for convenience we have chosen a small list of general words.

Since it appears very difficult to identify *a priori* precisely those variables which significantly affect the task time, we have attempted to provide a framework which permits the inclusion of all possible variables.

The full framework (see Table 1, p. 455) is as follows: the task is split into *components,* and under each component is specified all the associated information, e.g. relevant forms and files, and bibliographic elements involved. These

TABLE I

Task components

Consult (including read, scan, search)
Compare
Think (including assign, select, decide, calculate)
Write (including handwrite, type, stamp)
Prepare
Put away
Take out
Separate
Affix
Sort
Operate
Discuss
Move

Classification of tasks

CLASS	COMPONENTS	SPECIFICATION
Enter	consult	Which sources are consulted
	think	'Select' etc., which elements of information involved
	prepare	What preparations are necessary for writing
	write	Method used, details recorded, where recorded
File	consult	Which sources and which file
	put away	Which item
Extract	consult	Which sources and which file
	take out	Which item
Place	put away	Which object, where
Remove	take out	Which object, from where
Verify	consult	Which sources
	compare	Which elements on which item
	(action)	Which action
Sort	sort	How many, of which object, in what order
Attach	prepare	Which items, how
	affix	How
Separate	separate	Which items, how attached
Duplicate	prepare	Which items, on which machine
	operate	How many copies
Discuss	discuss	Which elements of information (if possible) which people
Move	move	What to where

components are not necessarily sequentially separate (unlike 'elements' as defined by IOM), but may on occasion overlap or be performed concurrently.

Thomas[9] gives a list of tasks identified in a number of library studies. Although these tasks are not identical to ours, the level on which they are defined is the same, and they can all be defined in terms of our variables.

Modelling of systems

The aim of the present project, then, is to assign standard times to the various tasks, indicating how these times are affected by the variables we have identified.

But given a list of tasks with their associated times (and costs), how could these be usefully used in a system design situation to estimate the cost of a proposed system?

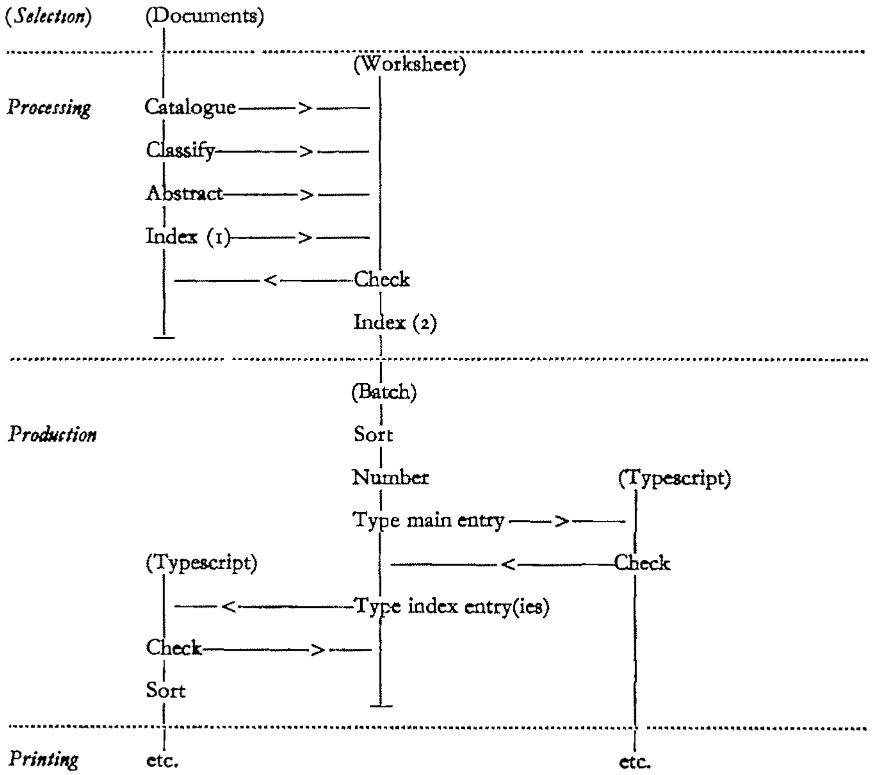
Clearly, the more detailed the data we provide, the more complex the synthesis of these costs will be. A similar scheme of standard times for typing (Burke and Watts[7]) consists of 13 pages of data and 96 pages of instructions on their use. It seems that, for the application of our scheme, the following will be necessary:

(a) The basic data concerning the cost of the appropriate unit tasks.
(b) Environmental data concerning the particular system under consideration.
(c) A model of the proposed system indicating how these data are to be combined.

Because of the probable complexity of the model, it would appear necessary to provide a general-purpose, adaptable model of a particular class of system, as a basis for any more detailed modelling exercise. This general model we call the 'notional system'.

As mentioned above, the present project is concerned with the production of current awareness bulletins. More specifically, we are initially covering non-mechanized systems from the input of documents (excluding selection) to the distribution of the bulletin. An outline of the notional system for this class of system is given in Table 2. We do not expect real systems to follow this pattern exactly; the point is to identify all the different operations that

TABLE 2: *Outline of notional system for production of current awareness bulletin*



'Index (1)' = 'index from original document'
'Index (2)' = 'index from abstract'

might be involved and to show how they are related, i.e., what is the input and output of each operation.

The model will also help to identify the system variables (b) which need to be measured in order to make the cost estimate. This is likely to be a major operation, and in some cases (for a proposed system in a new subject field) it may not be feasible to obtain all the desired data. For example, presumably abstracting time depends on the language and the form (periodical article/monograph etc.) of the document; therefore in order to estimate average abstracting time, one needs to know the relative frequency of different languages and different forms.

Because of the complexity of the modelling and data-gathering processes, it will be desirable to have some more approximate, more easily applied formulae for estimating costs. Thus we will attempt, with the aid of our notional system, to isolate the most important variables affecting the cost of larger units of operation, and give approximate formulae for these costs. For example, it may be possible to make an approximate estimate of the cost of producing an abstracts bulletin, with the aid of a few major variables such as number of items abstracted per year.

General comments

Some difficulties can be foreseen in the development and application of such a scheme of standard tasks with standard times. As previously mentioned, the accurate identification of all important variables is a major problem, which we have only begun to tackle. Those variables which we have specified above are generally closely associated with the relevant tasks, but there may be others equally important which are functions of the general environment, e.g. the size and nature of the organization might exert pressures on the staff which would be reflected in the performance of particular tasks. Similarly, the background, personality and experience of the individual worker might significantly affect the time taken. These, and other similar factors, may well warrant further study. The problem of deriving comparative costs is of great complexity, and requires careful definition of the many factors involved. Hopefully, this paper represents a first step towards such definition.

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Letter to the Editor

WASTAGE IN XEROX COPYING

Dear Sir,

It is difficult to understand Mr Peacock's complaint in the July issue of the *Proceedings* about the high cost of wastage in Xerox copying. Rank Xerox will always credit any wastage caused by machine fault but they can hardly be expected to bear the cost of wastage caused by the operator's stupidity or hamhandedness. Even where numerous people use the machine the latter wastage should be very low indeed and should certainly not rise to anything like the proportions indicated by Mr Peacock.

Yours faithfully,
R. G. GRIFFIN
Librarian

The Chemical Society,
Burlington House,
London W1V 0BN.
23rd July 1970

CURRENT AWARENESS LIST

Recent additions to the Aslib library catalogue are broken down into twelve broad groups, whose coverage is indicated below. These groups are not mutually exclusive but it is hoped that users will find them helpful in scanning for new items of interest.

Note: These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory.

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres; management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

JANET WALKLEY
Librarian

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Papers given at a Symposium held at Nottingham University in March 1969, arranged by Aslib in collaboration with the Ministry of Technology and the Research Associations.

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IAN F. FINLAY, M.A., F.I.L., F.R.S.A., A.I.Inf.Sc.

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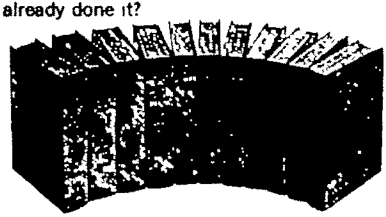

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A Procedural Model for the Use of Bibliographic Records in Libraries P. A. THOMAS

Here is the second part of a project, begun with Occasional Publication no. 3, *The Use of Bibliographic Records in Libraries*, aimed at determining the optimal information requirements in bibliographic descriptions or forms. Based on a general operational description of a library system, the model demonstrates what elements of information, bibliographic and administrative, are needed at the functional points within the system, and how they can be handled to keep retranscription to a minimum. Eighteen separate procedures emerge, common to all types of library. The author compares the model with an existing system to obtain basic information about forms and their function, and shows how this information may be used when designing forms or considering mechanization of parts of a library system.

Occasional Publication no. 4. SBN 85142 025 7: 35s net

Notes on the Operation of Specialised Information Centres JOHN MARTYN

This report is designed to help possible sponsors of a new centre to judge its usefulness. It describes the whole sequence of centre operations, suggests planning procedures, outlines various methods of operation and discusses their relative advantages. It offers guidance on a wide range of problems, from personnel requirements to accommodation, and assesses the prospects for earning income from a centre. The research for the report was carried out by an Aslib team at five OSTI-supported centres early in 1969.

Occasional Publication no. 5. SBN 85142 026 5: 15s net

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The Pilkington Technical Communications System: A formalization of the role of the 'Technological Gate Keeper' BRYAN YATES 507

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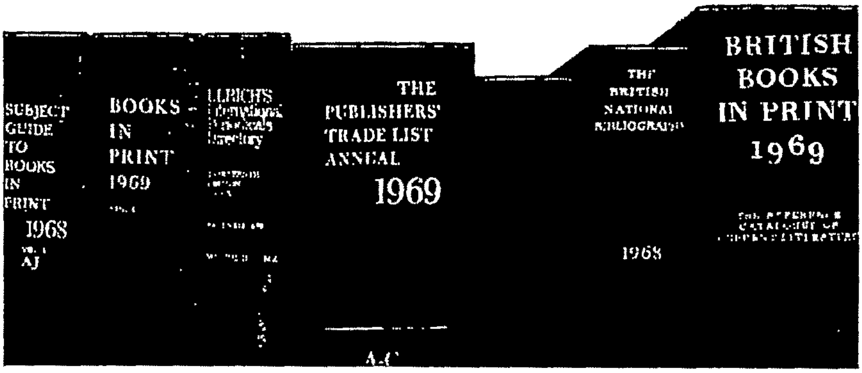
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ASLIB PROCEEDINGS
incorporating Aslib Information

Volume 22 **October 1970** **Number 10**

ASLIB CALENDAR 1970

November

TUE.3.	Engineering Group visit to IBM UK Laboratories, Hursley, Winchester.
WED.4.	Transport Group/LA Reference, Special and Information Section joint one-day meeting: 'Tracking down transport information'. Library Association, WC1.
FRI.6 and/or FRI.13.	Technical Translation Group visit: Session of course for translators. Holborn College of Law, Languages and Commerce.
MON.16–WED.18.	Audio-Visual Group Workshop. Aslib.
THU.19	Chemical Group. One-day conference: 'Operation Chemical Industry'. Quaglino's, London. Co-ordinate Indexing Group Meeting and Lecture: 'Use of sub-codes'.
FRI.20.	Technical Translation Group Meeting: Followed by: 'A linguistic approach to technical translation', by P. P. Newark (Holborn College). Annual sherry party. Aslib. 3 p.m.
WED.25.	Evening Meeting at Aslib. 'The archives of 20th century scientists and technologists'. Speakers: Professor N. Kurti, FRS, Mrs M. Gowing and Miss J. M. Pye. 5 for 5.30 p.m.
THU.26.	Aslib visit to NRLSI, Bayswater Division, W2. 4.30 p.m.

December

THU.3–SAT.6.	Audio-Visual Group/National Council for Educational Technology joint conference: 'Multi-media resource organization in higher education (for senior librarians and organizers)'.
MON.14.	Co-ordinate Indexing Group Meeting and Discussion: 'Sub-codes'. Aslib. 3.30 p.m.
WED.16.	Aslib Christmas Party. 5.30 p.m.
TUE.22.	Engineering Group Christmas sherry party and evening lecture. Aslib. 5 p.m.

Aslib 44th Annual Conference

Over 300 delegates attended the 44th Aslib Annual Conference from 20th to 23rd September, 1970, straining to the utmost the accommodation available at the University of Aberdeen. The theme of the Conference was 'Research and Development in Library and Information Science: Aims, Accomplishments and Expectations' and speakers included Philip Whiteman, C. W. Cleverdon, R. A. Fairthorne, M. B. Line, B. C. Vickery, J. Farradane, H. East, Dr D. N. Wood (whose paper was presented by J. E. Terry), Dr H. Coblans (with a paper presented by L. J. Anthony) and J. R. Sharp.

Dr J. W. Barrett presided over the Conference Dinner, at which Aslib entertained the Baillie William Craig (deputizing for the Lord Provost of Aberdeen), the Vice-Chancellor of Aberdeen University, Principal E. M. Wright, representatives of the University and City of Aberdeen Libraries, and Professor R. V. Jones and Professor G. M. Burnett of Aberdeen University, with their wives.

Delegates visited King's College Library and Chapel and the Science Library, University of Aberdeen; the Rowett Research Institute and Library, with the Commonwealth Bureau of Animal Nutrition, Bucksburn; the Torry Research Station and the Marine Laboratory and Library; Robert Gordon's Institute of Technology, Library and Library School; Crathes Castle and gardens, Banchory and the Bridge of Feugh; Wiggins Teape Limited, Stoneywood Works paper mill; and Grant's Glenfiddich Distillery, Dufftown.

Papers given at the Conference will be published in the November, December and January 1970 issues of *Aslib Proceedings*.

Engineering Group

The Aslib Engineering Group has held two meetings this year on the subject of microfiche. The large-scale adoption of microfiche is obviously engendering considerable problems, and while these are by no means specific to the engineering industry, perhaps they have been more forcefully encountered in that field.

The first meeting was held at Newcastle upon Tyne Polytechnic, and papers were presented on the problems of microfiche reports and periodicals. These papers were repeated at the second meeting, at the National Engineering Laboratory, Glasgow, and an additional paper was given on the comparison of microform formats. Both meetings were enthusiastically supported, and the Group feels encouraged by the generous sharing of the wealth of experience and information in this field.

Chemical Group: Proposal to establish a new educational course

The Committee of the Chemical Group are considering the establishment of a short course designed to introduce information and library personnel to the characterization of chemical compounds by means of physical and instrumental techniques such as ultra-violet, infra-red, mass and X-ray spectroscopy; X-ray and electron diffraction; magnetic resonance and chromatography. The course would deal with fundamentals and avoid treating the subject in depth: the suggested content is:

(1) Range of techniques available: nomenclature.
(2) For each technique: Theoretical basis
Data generated—its form; fundamentals of interpretation; type of information which can be derived.
(3) General guidance on selection of techniques; strengths and limitations of each; combined and hybrid techniques.

All those who would welcome the establishment of such a course are invited to indicate their support by writing to the Secretary, Mr B. Langton, County Technical Librarian, Goldlay Gardens, Chelmsford, Essex.

Audio-Visual Group

A conference on Multi-Media Resource Organization in Higher Education, intended for senior librarians and organizers, is to be held jointly by the Aslib Audio-Visual Group and the National Council for Educational Technology. This will take place from 3rd—6th December a the Hull Centre Hotel, Hull.

For further details contact: R. H. M. Fothergill Esq., National Council for Educational Technology, 160 Great Portland Street, London W1 N5TB; or Mrs J. Andrew, Secretary Audio-Visual Group, BBC Film Library, Windmill Road, Brentford, Middlesex.

The late Professor R. S. Hutton

Because of printing schedules it was only possible in our last issue to pay a brief tribute to Professor Hutton, one of the founders of Aslib, who died on 5th August at the age of 93. In this issue, we include tributes from a number of people connected with Aslib who knew him and worked closely with him in his indefatigable efforts for Aslib and technical libraries.

Miss E. M. R. Ditmas, General Secretary of Aslib, 1933–1950, writes:

It is difficult to realize that Professor R. S. Hutton's long life has drawn at last to its quiet close. For those who worked under him as Chairman of the Aslib Council in the 1930's his memory will always evoke the recollection of indomitable energy and of imperturbability in times of crisis, qualities which undoubtedly did much to tide Aslib over those difficult years.

Thinking of those days when I was a newly appointed General Secretary, still very inexperienced in the peculiar problems which beset Aslib, two memories stand out. It was a time when the Aslib staff had been reduced to one typist and myself, and one of Professor Hutton's rather intimidating habits was to ask me to meet him on the St Pancras station arrival platform where, en route for one of his endless City engagements, he would issue a series of instructions while sprinting for the exit and would expect me both to memorize these verbal messages and to catch a handful of drafts of minutes or agendas passed over in the manner of a relay race. There was no time for questions or second thoughts but, in fact, it was only by such means that he could keep in touch with Aslib's affairs in the midst of his own over-crowded programme.

The other memory is of my first conference and of an annual general meeting that was expected to be 'difficult'—I cannot remember now which thorny problem was at issue. Professor Hutton had been in the USA until the last moment and there had been no chance to consult him. When he did arrive he summed up the situation in a flash, took the Chair and steered the meeting past the danger point with impeturbable skill and left me, at least, wondering why the anticipation could have raised so much apprehension.

It is probable that few present members of Aslib realise the debt that we owe to Professor Hutton. He not only conceived the idea of the services which such an organization could render but, with the help of Mr A. F. Ridley, organized the first meeting which brought the Association into being. Even more important was his continued faith in it. With the help of the Carnegie United Kingdom Trust, one part of his plan was brought to fruition in the publication of the *Aslib Directory* in 1928, but thereafter followed a period of frustration and uncertainty coupled with financial insecurity, when some of Aslib's friends lost interest. Professor Hutton's faith in Aslib's potentialities never wavered. His refusal to abandon it inspired others. It is comforting to know that he lived to see at least some part of his dream realised—I say 'part' because Professor Hutton never let us rest on our laurels. Always he looked ahead to further developments, further maturity and efficiency in practice.

In the heyday of his career, time was for Professor Hutton a precious commodity but he gave it generously in Aslib's service. Our debt is inestimable.

Dr J. G. Pearce, Director of the British Cast Iron Research Association, 1924–1958, writes:

I first met Bob Hutton in 1920 when he was still connected with his family firm in Sheffield. The British Non-Ferrous Metals Research Association had just been established and his active and vigorous mind quickly ensured his election to its Council. I had joined Sir Arthur Fleming in 1917 to organize the Research and Education Department of the company to become known for some years as Metropolitan-Vickers at Trafford Park. We persuaded the Company to join the new Research Association and I was nominated to represent it thereon, and indeed also became a member of its Council and chairman of its publications committee. Hutton, who sought and received my support to this end, became its Director in 1921.

We quickly found common views and interests, among them particularly the importance of documentation and the proper treatment and distribution of information and the overriding importance of the application of science and technology in British industry. Many of the industries with which he was concerned, and with which I was later to be concerned, comprised at that time small units, in which these ideas were difficult to introduce.

I was greatly impressed by his energy and range of interests, which found expression, among other things, in the establishment of the Institute of Metals, the Sheffield Gas Consumers' Association, and, of course, Aslib itself. His combined academic and industrial experience fitted him singularly well for his subsequent activities at a time when it was very difficult to get outstanding technologists, especially when manufacturing industry was still wedded to the craft basis, and to experience rather than training, which inhibited the entry of able scientists. He has told the story very fully in *Recollections of a Technologist*, published in 1964.

His energy and resilience seemed so unfailing that, although aware that he was an older man, I was astonished to learn in comparatively recent years that he was my senior by some fourteen years. It was he who suggested, after taking charge of the BNFMRA, that I should take on the post of Director of the British Cast Iron Research Association. The research association movement was progressing slowly, due mainly to the conservatism of British producers and their fear of sharing alleged trade secrets with their competitors. He put it to me that the loss of a research association would reflect adversely on the whole movement. I was appointed early in 1924. While our contacts diminished in number they were sustained greatly in such activities as Aslib, in which he succeeded me as Chairman of Council, and the then embryonic committee of directors of research associations, and elsewhere. However, on his transfer to Cambridge they became fewer.

Hutton was a man of great integrity of mind and character, and I never knew him to pursue a course of action with any personal advantage in view. Like all pioneers he doubtless had his disappointments and made occasional mistakes, but his equable temperament enabled him to bear them with equanimity. Altogether, his life and work form a remarkable record of prescience and activity in an unusual variety of fields, among which Aslib, of course, was outstanding.

Mr B. Fullman, Chief Information Officer of the British Non-Ferrous Metals Research Association, 1944–1963, writes:

I first met Hutton forty years ago, when he appointed me Editorial Assistant at the British Non-Ferrous Metals Research Association, of which he was Director. Actually I worked with him for less than three years, for in late 1932 he was appointed the first Goldsmiths' Professor of Metallurgy at Cambridge. But through our common interests, we always thereafter remained in contact with one another. I like to remember that in the fairly recent past, seeking information about a man under whom (70 years before) he had done some research, Hutton turned to me for help.

My appointment at the BNFMRA in 1930 was my first introduction to information and library work. I was immediately brought into touch not only with Hutton, but also with Arthur Ridley (then Librarian of the Association), both of whom with J. G. Pearce (Director of the British Cast Iron Research Association) had six years earlier organized a week-end conference which led to the foundation of Aslib. Had I then known that my life was to be spent in the information field, I could hardly have prayed for two better sponsors than Hutton and Ridley. Through them, I immediately found myself involved in Aslib affairs. I well remember that in those early years I wrote a paper for Aslib, and was so nervous about facing an audience that I asked Ridley to present it for me!

In Hutton's long, active and exceptionally varied life, one of the continuous threads was the dissemination of scientific information and the development of libraries. The remarkable thing is that, from his own account, he was never interested in reading for its own sake. In his *Recollections of a Technologist* he says (Chapter 12, p. 149, para. 1): 'Unlike my elder brother Edward Hutton, the writer, I have never taken any interest in literature, and the only books I read as a boy were those set to us as holiday tasks'. The interest he took in *scientific and technical literature* is writ large in his life's work: I wish that I were a psychologist to understand this baffling problem.

Looking back across forty years, I cannot remember any personal difficulties in the days when I worked for Hutton. Presumably we both took it for granted that information service was one of the necessities of life.

Nowadays the word 'information' figures very large: indeed, some of its involutions baffle my simple mind. But I hope that the modern practitioners, reading the recollections which he wrote with such astonishing clarity in the ninth decade of his life, will remember that Robert Salmon Hutton was one of the people who put it on the map.

Miss E. W. Parker, formerly Information Officer at the Mond Nickel Company Ltd, writes:

Today, when technical information service is so widely recognized as a significant factor in industrial development, it is difficult to realize that some fifty years ago such facilities were only the dream of idealists.

In the 1920's, however, the development was in embryo, favoured by some forward-looking organizations, but regarded with some suspicion by the less progressive.

In this field Dr Hutton was an outstanding pioneer. From his central position in relation to one of the major industries, he had a unique opportunity to advance the cause, and he devoted his untiring energy towards furthering exchange of information among all to whom it could be practically useful.

In this connection he was, as noted elsewhere, foremost in promoting the formation of the Association of Special Libraries and Information Bureaux, and in encouraging development of certain individual technical information services which were currently being established. He set up two-way contact between such centres and the BNFMRA and did much to promote interchange of experience among technical groups. The writer, then engaged in building up the service initiated, in 1926, by The Mond Nickel Company Ltd, would pay warm tribute to the encouragement and assistance received from Dr Hutton and his colleagues, and to the value of co-operation received from other information officers. The atmosphere of collaboration during the 'spade-work' years, which has so satisfactorily matured in the intervening period, is a lasting tribute to the vision and energy of Dr Hutton and his co-workers of the early days.

Research in Progress

Since 1968 the *Library Association Year Book* has included a brief listing of all the major library and information research projects currently in progress in this country, together with a note of projects recently completed. The following categories are not listed: research whose end-product is a bibliography, union list or like publication, theses for the Fellowship of the Library Association and research or planning projects which cannot really be described as formal research projects.

All organizations and individuals known to be engaged in major pieces of library and information research have already been circularized with a request to supply certain basic details for the 1971 listing. It may well be, however, that some have been overlooked, and any reader of this note engaged in such research and who has not received an information form is requested to contact the Research Officer, The Library Association, 7 Ridgmount Street, London WC1E 7AE as soon as possible.

Institute of Information Scientists: Scottish Branch

The next meeting will be held on Wednesday, 4th November, at 7 p.m. in the Livingstone Tower, University of Strathclyde, Richmond Street, Glasgow, when J. D. Turton, BSc, Commonwealth Bureau of Animal Breeding and Genetics, Edinburgh, will speak on 'Mechanization of abstracting services'.

Report of FID/II Symposium

The report of the *Symposium on communication of scientific and technical information for industry*, held in Rome in October 1969, has recently been published by FID.

The Symposium, arranged by FID/II (Information for Industry), was designed to assist information services and their users in ensuring a more effective transfer and utilization of the flow of information. The 29 selected and digested papers cover: Information and the enterprise; Users of information; Information activities at the national level; and International co-operation in the field of information.

The report is available from the FID Secretariat, Hofweg 7, The Hague, at 15 guilders per copy.

UDC: English Full Edition

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Copies of BS 1000 (631/632) may be obtained from the BSI Sales Branch at 101/113 Pentonville Road, London N1 9ND. Price by post 28s (24s to subscribers).

The Arts move to Belgrave Square

Lord Eccles, Paymaster General with responsibility for the Arts, recently moved from the Department of Education and Science in Curzon Street, London W1 to 38 Belgrave Square, London SW1.

Staff with responsibilities in relation to the Arts, Museums and Galleries, and Libraries have been brought together in one branch of the DES and will accompany Lord Eccles to Belgrave Square. The branch will be headed by Mr H. T. Hookway, Assistant Under Secretary of State.

The telephone number for Belgrave Square is 01-235 4801.

Course on co-ordinate indexing

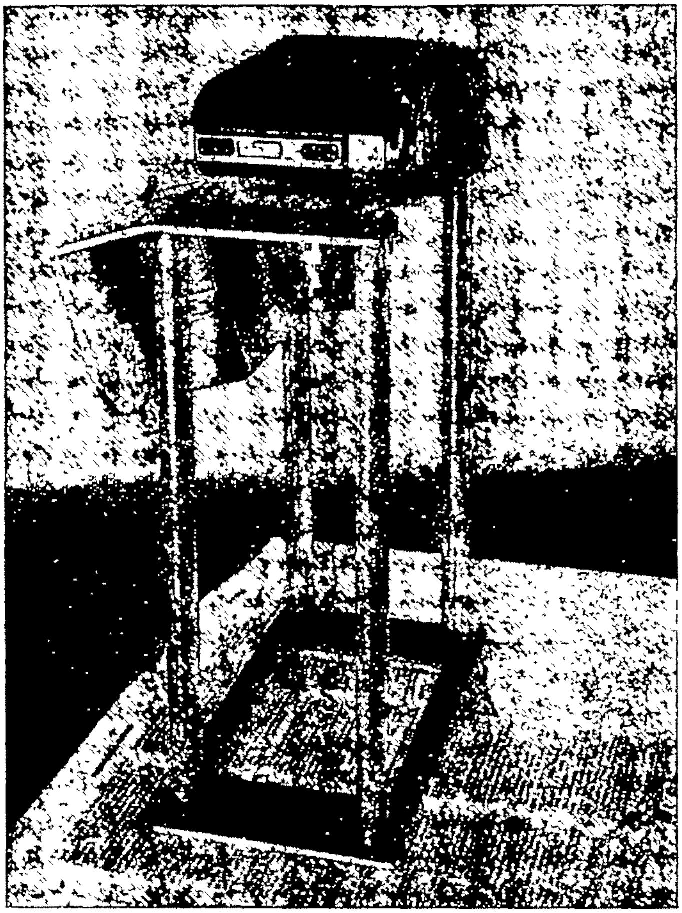
J. L. Jolley and Partners are arranging a two-day advanced course on co-ordinate indexing designed especially for people who have already had at least one year's experience with a co-ordinate indexing system. The course will be held on Wednesday and Thursday, 2nd and 3rd December. It will assume that the basics are known and will concentrate on solutions to problems which have arisen in practice. Applications should be sent to: J. L. Jolley and Partners Ltd, Westbourne House, Westbourne St, High Wycombe, Bucks. (Tel. High Wycombe 20425).

A 35 mm hand camera with electronic flash for compiling lists of references

Like most other documentary technical information units, the Information Section of the Reactor Group HQ at Risley aims to prepare lists of references for its users as simply and quickly as possible. The sources used are mainly the published abstract journals—notably *Nuclear Science Abstracts*—and the UKAEA card abstract index to reports. Up to 1968 the Information staff wrote the serial number/s of the abstract/s required on paper slips, between the pages, and extracted the relevant UKAEA index cards, all of which were then copied by reflex photography, and the unwanted matter trimmed off before presenting the prints to the user. This frequently involved the searchers in carrying armfuls of bound volumes some distance to the copying machine, where they were immobilized until the operator could deal with them.

At about this time, it was found that the Photographic Section at AEE, Winfrith had built a stand for a 35 mm Exakta, with mains-connected electronic ring-flash, which enabled the Information Office staff to make copies while carrying out literature searches, simply by placing the stand on the document, connecting to the mains socket, switching-on, setting the camera shutter, and pressing the release. Enlarged prints were then quickly produced from the exposed 35 mm film.

From Risley's point of view, this equipment suffered from the disadvantages of being unusable away from mains sockets, and of having a separate and sizeable power pack, with cable, accompanying it. Winfrith's specification was accordingly modified, in consultation with the Senior Photographer of the Reactor Engineering Laboratory, where a device to meet the new requirements was constructed. The resulting equipment is based on the Praktika Nova f/2.9 SLR camera and one Prinz Jupiter 202 battery flash unit. Polaroid filters are fitted to both camera lens and flash unit, crossed at 90°, to eliminate a 'hot spot' reflection. The one on the lens also acts as a neutral density filter. This system makes exposures virtually independent of ambient lighting conditions. The cost of the equipment was £34, excluding stand and labour costs. The stand is of aluminium rod and plate, and the camera is secured to the top plate by the lens mounting. Further details are given below.



Construction

Overall height of camera and stand = 12 in, width = 7½ in, depth = 4 in.
Distance from front of lens to surface to be copied = 8¾ in.
Weight 4 lbs.
Small extension ring fitted to lens mount.
Focus pre-set and fixed by taping with Sellotape
Viewfinding by placing the 3 in. × 4½ in. mask over the printed matter
Depth of field ensures sharpness of focus in the gutter of quite large volumes.
Shutter speed set at 1/30 second, aperture set at f/16.

Film

Kodak 'Panatomic X' FX 135–36 in normal cassettes.

Flash Batteries
Exide 1½V HP7. Four batteries, good for four cassettes (144 exposures).

Operation
The flash unit is switched on; when the red indicator lights up, the camera shutter release is pressed. For the next exposure, a lever is turned, which simultaneously transports the film and resets the shutter.

FROM *J. Roland Smith,*
Chief of Library & Information Services,
UK Atomic Energy Authority, Risley

Publications Officer

Mrs Jill M. Sutcliffe, Aslib's Publications Officer, left the staff of Aslib at the end of August to take up an appointment with Baillière, Tindall and Cassell, medical and scientific publishers. Her colleagues at Aslib wish her well in her new post.

We welcome as our new Publications Officer, Mr Richard Coleman, who comes to us from Pergamon Press where he has had wide experience in publishing, particularly journal publishing.

Dr J. C. Withers

Aslib has lost by death another of its earliest supporters, Dr J. C. Withers, formerly Director of the Shirley Institute. Dr Withers was for many years Treasurer of the Northern Branch of Aslib, and a member of the Council 1948–49, and again, as the Northern Branch representative, 1954–55. He was elected an Honorary Member of Aslib in 1952.

BRIEF REVIEWS

ANDERSON, I. G. *ed.* Councils, Committees, & Boards: a handbook of advisory, consultative, executive & similar bodies in British public life. Beckenham (Kent), CBD Research, 1970. 240 p. £4 ($15). (SBN 900246 06 5)

Another original reference book has appeared from the publishers CBD Ltd. This publication includes hitherto confusing and sometimes untraceable information about Councils, Committees and Boards. The scope is limited to national or regional bodies in any part of the United Kingdom, which are already in existence or are projected.

Information given in each entry usually includes full address, date of establishment and constitution, authority for the body's original establishment, the number and composition of the members, the names of the chairman and secretary, terms of reference, activities, and titles of any publications. A symbol indicates whether the details were provided by the organization itself: this is the means by which most of the entries were compiled.

The publication is divided into four main sections: bodies listed alphabetically by title, abbreviations index, an index of chairmen of the organizations, and a subject index. It is a welcome change to see a publisher giving the date that the book went to press, May 1970, and also taking the trouble to include a leaflet of amendments and additions up to the end of July, some of which occurred because of the change in government.

CHAMBERS, HARRY T. Copying, duplicating and microfilm: systems and equipment for use in business and administration. London, Business Books, 1970. 151p. 50*s*. (SBN 220 0992169)

An up-to-date guide is intended to the range of machines, processes and systems now available for reproducing, storing and distributing information. Each system is analysed with regard to requirements, availability and cost. The important part played by copying in the management structure is discussed. Systems covered range from duplication to the use of computers with a more detailed study of microfilm techniques and uses. A glossary of copying terms is included and details given of buying and renting equipment and the legal aspects of copying in relation to copyright.

GRAY, DWIGHT E. So you have to write a technical report: elements of technical report writing. Washington, DC, Information Resources Press, 1970. 117p. $3.25 (ISBN 0 87815 002 1).

This guide to technical report writing stresses the need for preliminary thought before a word is written. The likely level of the readers at whom the report is directed should be ascertained and this will determine the degree of technicality of the report. To avoid repetition and ensure a logical argument an overall plan must be worked out (i.e., an introduction, body and conclusion). The points to be included in each section should also be listed. The preparation of appendixes, references and abstracts is also discussed.

WALL, C. E. *comp*. Periodical title abbreviations. Detroit, Gale Research Co., 1969. 210 p. $15.

This publication lists periodical title abbreviations that have been used in a number of sources. For this first edition, emphasis has been placed on language, literature and linguistic sources, although many general sources have also been analysed. The compiler checked several hundred indexes, abstracts and bibliographies and some thirty periodicals were searched issue by issue.

The abbreviations are listed alphabetically followed by the full title of the journal. The publication is especially useful for indicating the titles of different journals which have the same abbreviations: one questions, however, whether some of the abbreviations listed were misprints in the original sources. Sometimes the place of publication is shown for a journal if it is necessary to distinguish it from a similar title. The work could have been an even more useful reference tool if the place and dates of publication had been included for each entry.

WHITE, D. How to find out in iron and steel. Oxford, New York, Pergamon Press, 1970. 184p. 35*s* cloth (SBN 08 015790 4); 25*s* paper (SBN 08 015790 4).

This guide to sources of information in the iron and steel field has twelve chapters, varying from straight Information Services and Libraries through Translations, Patents, Reports, Conference Proceedings and Trade Literature, to Education and Visual Aids, History and Organizing Information. The author therefore sets out to cover a wide range of sources, but is unable to deal with each of them in sufficient detail to do justice to the authorities discussed.

As with most reference books, it is unfortunate that there is included information which is now out of date because of changes which have occurred since the book was written. However, there are also several unfortunate avoidable lapses and omissions regarding details of editions, breadth of coverage and pros and cons of competitors in certain subject areas. In spite of such errors, this book should prove a helpful tool for librarians and research workers in the iron and steel industry.

AN INFORMATION RETRIEVAL LANGUAGE FOR MARC

D. AUSTIN
BNB MARC Project

Paper presented at the 19th Annual Conference of the Aeronautical Group, Cranfield 10th–12th April 1970

I SEE from the programme that I am supposed to talk on an information language for MARC, and it is true that the work I have been doing for the past year or so has been under the auspices of the MARC Project. But the subject indexing system we have developed is concerned as much with BNB's plans for computer production from 1971 as with the MARC tapes as such, and I hope to show that we have also gone some way towards developing a compatible general system with even wider application. Before coming to this, however, it is necessary to describe briefly some of the day to day pressures of work which caused BNB to look to the computer for help. From this we can see how the computer forced us to reconsider our whole approach to subject indexing.

From January 1971, BNB will be produced each week from the MARC magnetic tape, and these tapes will be stored so that we can achieve—all being well—much faster and more accurate cumulations, without the present clerical drudgery of interfiling thousands of separate cards when building our quarterly, annual and multi-annual volumes. This job of card sorting and filing applies not only to the making of cumulations, but also to BNB's present system of subject indexing. As I am sure you know, BNB is currently served by a chain index. Although this is an admirable way of constructing a subject index on the foundation of a classified sequence of catalogue entries—it is quick, and cheap, and reasonably expressive—it does involve a great deal of clerical labour on the week to week basis to which BNB is geared. Each week's issue of BNB is assembled in the form of several hundred catalogue cards arranged as a classified sequence. Each of these cards shows only the specific class number appropriate to the document, not the whole of the chain, and once a week all the missing but necessary steps in the classification are added to make the chains complete. At the same time, all the index entries appropriate to each step of the chain are extracted from a main file of cards kept in Dewey order. They are then re-arranged into an alphabetical sequence to serve as copy for the subject index which is printed at the end of the month, and when this has been done, all these cards, now in alphabetical order, are sorted back again into classified order and re-filed in the main sequence ready for the next week's issue, when the process begins all over again. This outfiling, re-ordering and infiling is the kind of drudgery we are hoping to eliminate by using the computer.

Despite the labour involved, it has been clearly shown that chain procedure is a very suitable and economical method of producing a regular subject index so long as it can be based upon a file of entries arranged in a classified order. A new document inserted into such a sequence will often contribute index entries which are appropriate to other records in the same issue, so that, for example, the index entries relevant to a book on physics automatically provide some of the entries for other works further down the chain, on, say, light or gas dynamics. However, documents are not recorded on the MARC tape in anything like a classified order, but in the random order in which they are received from publishers and handled by the cataloguers. A chain index is obviously a more difficult proposition in these circumstances, since one cannot anticipate how far the index entries appropriate to one document will also serve some of the needs of another. It is then a simpler proposition to index each entry as an independent item, so that its subject data is complete before it is recorded on the tape. Every record on the MARC tape then becomes a total data package in its own right—author, title, collation, Standard Book Number and so on, as well as any appropriate class number and a full set of subject index entries. The big question which faced the MARC team at BNB was how to achieve this from the subject point of view without giving up the standards of specific subject indexing which BNB has built up over a period of some twenty years. Subject data is represented on the MARC exchange tape by two different systems of classification—that is, Library of Congress and Dewey Decimal—as well as by the appropriate headings from the Library of Congress Subject Headings List. I doubt whether anyone would seriously defend these as satisfactory schemes for information retrieval, and although we are now under pressure to include a UDC number on the MARC tape, the rumour has reached us that this scheme also has its critics.

BNB therefore set up a research project to explore some other means for providing a satisfactory alphabetical subject index to current book material. Because of the problems I have mentioned, it was not, however, stipulated that this should necessarily be a chain index. It would in any case be impossible to devise a chain index based upon one of the classification schemes on the MARC tape, say, Dewey, and expect this to provide an equally efficient index judged by the standards of one of the other systems, say UDC or Library of Congress, since these vary enormously in their basic structure. However, certain features of BNB's chain indexing practice were set as standards which should not be abandoned. Firstly, we felt committed to a specific and pre-co-ordinate index, and we saw no point in providing just another system of keyword descriptors or subject headings, especially as Library of Congress subject headings already appear on each record. In particular, we wanted to retain the ability to index to whatever depth seemed justified by the document to hand. This drive to specificity had, of course, already given rise to BNB's use of the bracket one device and letter notation as means for extending Dewey's usually inadequate tables. Indexing to this depth certainly cannot be achieved by using Library of Congress subject headings in the standard fashion required on the MARC tape, since these prohibit the creation of any new heading which has not been recognized and authorized in Washington.

As well as retaining this goal of specific indexing, BNB also felt committed to a pre-co-ordinate subject index, and decided to explore the feasibility of a fully pre-co-ordinate system in which the user is informed of all the concepts which make up a compound subject, regardless of which term he chooses as his entry point to the alphabetical file. In this respect it is worth noting that the chain index is only partially pre-co-ordinate. The user is not informed of *all* the concepts which together make up the subject until he enters the file under the final term in the chain. As entries are made nearer to the start of the chain, the number of concepts transferred to the index becomes progressively fewer at each step, so that, for example, a document on aircraft wings would first be indexed by the single entry 'Engineering'. It has long been recognized that this kind of chain index noise can be a source of irritation to the user who genuinely wants a general textbook on engineering, who finds this term in the index, turns to the classified sequence, and then finds that this entry serves only to introduce a chain leading to the document on aircraft wings. A fully pre-co-ordinate index would have stated this fact under every term in the chain.

With these aims in mind, it was decided to look afresh at the entire role and structure of an alphabetical subject index, starting from the point at which a book is first opened by an indexer, and ending with the production of a set of index entries. For the purposes of MARC, the system has to be amenable to machine production, and the system we developed—which was worked out in close collaboration with the MARC data processing team—is capable of producing index entries either manually or by computer.

Except in those systems, like KWIC and KWOC, in which raw titles are used as the basis for an index, the first stage in making any set of entries for an alphabetical subject index are best considered as a series of stimulus and response reactions. Terms expressing the key concepts in a subject, together with others which convey the relationships between these concepts, come into the mind of the indexer as a document is examined. These are mentally processed in various ways as the examination proceeds, some words being modified, some relationships shifted, while certain concepts, which at first seemed relevant, are later entirely abandoned. Ideally, I suppose, one would finish up with the subject content of any document reduced to a set of key terms structured into some kind of fully expressive natural language phrase showing exactly how one concept is related to another, and perhaps best exemplified by the descriptive title on a British Standards specification. This first stage of examination and sifting is probably common experience to everyone engaged in classification or indexing. What happens after that depends upon the system we happen to be using. In the present system used at BNB, this subject statement is next considered as belonging within some main class in the Dewey Decimal classification, and it is there located under the nearest containing head in the tables. Nobody pretends that this is a satisfactory way of handling information, and even though we have the facility, through our bracket one device, to extend this placing verbally if it is not sufficiently specific, the classifier is still frequently aware that he has virtually crammed the subject into a quite unsuitable starting place in the schedules, simply because a better one has not yet been provided. And no satisfactory way has yet been devised for dealing with the cross-disciplinary study in a classification scheme based upon rigid main classes.

But the whole situation changes radically if the indexer is freed from these constraints of a chain index based upon an enumerative classification like Dewey. He is then virtually back at square one, to the point where, having studied the document, he should know the key concepts which comprise the subject he is indexing, together with those relationships between concepts which uniquely distinguish one subject from another. Now, however, instead of having to tailor this mental representation of a subject to fit the printed schedules of a classification scheme, the indexer would be free to express it in whichever way seems most appropriate for the document in hand. This certainly does not mean that the indexer can now, with a happy abandon, pick any words he likes and cite them in any order he chooses. If subject indexing is to be effective, it is essential that a concept should be represented consistently by the same word or words whenever it appears, with a regular and predictable use of references from synonyms and other related terms. It is equally essential in a pre-co-ordinate system that whenever this subject appears again in the future, it should be represented in the index by the same terms cited in the same order.

The indexer is therefore faced with two of the basic questions which lie at the heart of any information system—that is, how to achieve control over his vocabulary, and also, in a system which intends to show the relationships between concepts, how to ensure a consistent citation order. But now that the relatively simple solution of tailoring the subject to fit the terminology and concept order of a printed classification has been removed, it is clear that the indexer needs some alternative means for deducing consistent answers to these questions. In a sense, the tables of a classification scheme are used in a chain index as a decision making model against which each step in indexing is matched as a subject is built concept by concept. In freeing ourselves from this kind of index, we must have some alternative model which will not only regulate the terms used and their citation order, but it must also hold effectively across the entire spectrum of knowledge, since this is the extent of subject coverage in both MARC and BNB. The model has to perform as well when indexing, say, religion and sociology, as it does in engineering and geography.

We have now reached the point where we can lay down certain definite aims of this stage of the research. Firstly, we set as our goal a system of pre-co-ordinate indexing at least equal in its depth to that offered in the past by BNB's chain procedure. The research team was also free to investigate the possibility of producing an index in which a full subject statement could be offered to the user under each significant term in a compound subject, so overcoming one of the inherent disadvantages of the chain index. And it was postulated that the index need not be based upon chain procedure at all, nor tied to the terminology or concept order of any of the traditional classification schemes which appear on the MARC record, although the indexer must then acquire some alternative model for achieving vocabulary control and ensuring consistent citation order.

Having in this way identified the aims and the problems facing the indexer, I now want to leave this aspect of the research altogether for a while, and turn instead to something which at first glance may seem quite unconnected with alphabetical indexing. But we shall come back later and take up these questions again at the same point, after considering another piece of research which, as it turned out, gave us the model we were looking for.

The indexing research had reached this point, about a year ago, when I first became involved. Up to that time, I had been concerned in a different project, under the auspices of the Classification Research Group, to explore the theoretical basis for a new general classification. The urgent need for a new general scheme had been expressed in various papers and at international conferences as long ago as the early 1950's. In the light of increasing pressures on information services, the available general schemes had been especially criticised on three main and well-known points. First, on the grounds of currency—printed tables such as Dewey and the Library of Congress cannot possibly keep abreast of recent advances in knowledge. Secondly, they are not sufficiently specific, and frequently no attempt is made to provide notation for a particular topic even after it has become established in the literature. Thirdly, they are quite unable to deal with the cross-disciplinary study in any satisfactory way. The latest manifestation of this particular problem can be found in the material we are now handling on the biological and psychological aspects of space flight, which are as much the province of the doctor and biologist as of the vehicle designer and operator.

At first glance, it might appear that these problems are of real concern only to the librarian concerned with organizing information across a wide range of subjects, as in a city reference or university library, or, of course, the national bibliography. It has been argued that they do not apply to the special librarian, who is quite capable of organizing his own special subject in the most appropriate way. However, since I started this research, I have had contact with so many specialists facing completely general problems that I doubt whether this is entirely true. For example, the librarian developing a special scheme for the construction industry must reach a point when he wishes to divide buildings by their function. Immediately he reaches this point, he requires access to concepts dealing with, say, religious orders such as Augustinians, and religious actions such as the Mass. The same kind of generality must, so far as I can see, be inherent in all special schemes. Unfortunately, I have had no contact with librarians in the aircraft industry, and I should be most interested to know how far this is, perhaps, a self-contained field.

The Classification Research Group reached the conclusion that all these problems associated with existing general schemes can be ascribed to a single cause, and that they are inherent in any system which is based upon a main class structure. In these traditional schemes, the first approach is to some postulated universe of knowledge, which is progressively broken down into disciplines, classes, subclasses and so on, this process of hierarchical fragmentation continuing until the necessary or economic limit of specificity has been reached. Each step in such a hierarchy is considered only from the viewpoint of the particular hierarchy which is being constructed, and it is represented by a parallel system of notation which identifies the main class and its subdivisions as closely as possible. This not only gives rise to the three major problems I mentioned earlier—that is, poor currency, inadequate specificity and the cross-discipline problem. It also makes these systems quite unsuitable for efficient machine filing and retrieval. It will obviously be very difficult to prepare a programme which will allow an enquirer to retrieve a specific concept from an information store if the notation which represents that concept keeps changing —in the way, for example, that the material 'Iron' is represented in UDC by at least seven completely different bits of notation, depending on whether it is regarded as an ore, an element, a mineral, an engineering material, and so on.

These problems seem to be inherent in any system which approaches information through some postulated universe of knowledge, breaking this down into separate and discrete subjects regardless of the concepts which are involved. The Classification Research Group therefore took the obvious, but difficult, step of abandoning altogether this approach to the specific concept through the main class structure of a universe of knowledge. Instead, they approached the problem from the opposite end, via a postulated universe of concepts. In this approach, each separate concept is considered as a unique item in its own right, to be assigned to a category of closely related ideas, where it should be notated once and for all. It would then be ready for use by a classifier in the representation of any compound subject which includes this particular concept, and can be retrieved by a computer from any part of the information store. Eventually, the categories established in this way would accumulate to form thesauri of concepts organized according to the basic idea which each one represents. I should emphasize that these categories are intended to represent groupings of ideas, not of terms. The aim is to bring homologous ideas together in such a way that they share a common notational base. Only in this way can an enquirer learn of work which might have some bearing on his own problems, even though it has been conducted in a different and perhaps unsuspected field of study which possesses its own terminology or jargon. It should be possible, for example, for the specialist studying the problems of, say, distribution in marketing to become aware of any relevant work on dispersion in physics or even dissemination in information science. On the understanding that distribution, dispersion and dissemination are closely related concepts, they would share enough of a common notation to make any one of them readily retrievable to a specialist concerned in the others. So long as the notation is machine-readable, and its function is limited to the expression of this basic homologous relationship between concepts, it would then serve as a true meta-language, and should allow the specialist to scan related studies not only in other disciplines but also in other natural languages. If basic ideas can be organized in this way, it obviously should not matter whether the words which represent these concepts are in English or Swahili.

If this system is to work, it is essential that these thesauri should be structured according to a single basic relationship between concepts which is applied consistently throughout them. This is conceived as the generic relationship, which is already familiar in the taxonomic classifications of the natural sciences, but would be applied in the proposed system on a much wider basis, to reveal not only that the horse, for example, is an equine, a mammal, a vertebrate and so on, but also that orange is a colour lying in the spectral range between yellow and red, being part of a general category called appearances, and that rivets and screws belong to a category called fastening devices, and have obvious affinities with nails and adhesives. In time, of course, these thesauri would come to resemble an expanded version of the original thesaurus of Peter Roget, rather than many of the unstructured lists of keywords which are now familiar.

Having taken the decision to build the generic relationship into thesauri in this way, research was next concentrated upon defining any further relationships between concepts, so that these can be incorporated by the classifier into any conceivable compound subject. There are not so many of these fundamental relationships as might be expected, and those we have discovered are shown in the list of relational operators (Table 1). This list tends, however, to exaggerate

TABLE 1

(a)	*Form*—physical, e.g. *Microfilm*, or narrative, e.g. *Journal*
(b)	*Target*—e.g. *For managers*
/	*Field membership, quasi-generic relationship*
,	*Difference*—concept used adjectivally
(p)	*Subsystem, structure, material*
(q)	*Property, percept*
(o)	*Study region, sample population*
(1)	*Viewpoint, perspective*
(2)	*Active system*
(3)	*Effect, action*
(4)	*Key system*
(5)	*Discipline*
(6)	*Environment*
(v)	*Co-ordinate concept*
(w)	*Co-ordinate correlated concept*
(x)	*Co-ordinate subject in same document*

the actual number of relationships involved. Apart from the fact that some of these operators specify extraneous factors, such as bibliographic form and the intended reader, in some cases the same relationship appears in more than one place in the list, but is considered from a different point of view. These operators have two distinct functions to perform in a synthetic classification. In the first place, they specify the role of the concept which follows the operator, so that, for example, an entity such as an aeroplane would be introduced by the operator (4) if it was considered as an object in its own right and constituted the principal topic of a document, but it would be introduced by the operator (2), indicating an active system, if its special role in, say, freight or military transport were being considered. At the same time as the role of any concept is specified in this way, its citation order is also determined by a special rule of classing associated with each of the operators. As a general rule, operators are cited retroactively, which leads to an order of precedence such that a thing is set down before its parts or its properties, and also before an action performed upon it. The action must be named before the responsible agent is cited, and so on.

The intention is that these operators should be incorporated as elements built into the notation which represents a compound subject, so that in effect the classifier uses the operators like nuts and bolts to build each subject up into a unique pattern out of its component parts. If this goal should prove feasible, it will be seen that we should have gone a considerable way towards overcoming most of the problems which are inherent in traditional classification schemes. For a start, the system is eminently suitable for machine filing and retrieval and has been developed more with this end in view than the creation of just another system of marking books and catalogue cards. The depth to which a subject is analysed is entirely under the control of the classifier, and no longer depends on the published tables of an enumerated scheme. Providing that the appropriate concepts appear already in the thesauri, the classifier can create compound subjects in this way as soon as literature on them begins to appear, without waiting for an editorial decision, so that both currency and hospitality are overcome at the same time. If he is running an SDI service there is no reason why subjects should not be built in this way even before the literature appears. Obviously, there will be occasions when a completely new concept first appears which has not yet been notated, but I think that most of us encounter very few completely original ideas in a lifetime. Advances in knowledge come less from the evolution of completely original concepts, than from the juxtaposing of existing concepts in original and sometimes unexpected ways.

There is not time at the moment to explore the various ways in which such a system might be used for information control and retrieval, and in any case, this would be largely a matter of speculation, since there has been no opportunity for developing the scheme to the point where trials using notation could be carried out. But apart from the cross-disciplinary and cross-language searches I mentioned earlier, the user of the system should be able to vary his search strategy in various ways which will allow different approaches to machine browsing. He could, for example, retain the operator which introduces any particular concept, but drop the notation for the concept itself, asking for documents on any other concept which has assumed that particular role in the subject. Or he could retain a specific concept, but enquire into any other role which it might have fulfilled by asking for changes in the operator. If search strategies of this kind are to be allowed, the store must obviously be organized in special ways which ensure the fastest possible access to any particular concept. This, I am assured by our data processing team, is best achieved by organizing inverted files, in which the whole of the notation which represents a compound subject is entered in the store under each one of its component parts, and in which the parts come in turn to the lead position and serve as the filing medium. Although this obviously requires a large store, since a seven element subject may well file in seven different places in the store, our data processing people assure me that this is justified by the considerable gain in speed which is achieved. The computer team we use in MARC seem to be convinced that by the time such a system is developed, the problem of store size will no longer be the critical factor it is at present. They also begrudge every microsecond spent on locating and searching their files.

For the present, this is as far as I can usefully describe these theoretical aspects of a new general classification. The project was initially financed by the NATO Science Foundation, and work had nearly reached this point when the money ran out. The project was then independently financed by BNB for nearly another year. I should point out that since BNB relies entirely upon income from sales and is not subsidized in any way, it is obvious that our resources for research are very limited. I can, however, summarize the results that had been achieved in the available time under three main heads. Firstly, we had established the necessary basis for organizing concepts into categories, and categories into thesauri, according to the generic affinities between ideas—that is, we had established a theoretical basis for vocabulary control. Secondly, we had developed a different but complementary system, represented by the relational operators, for organizing the separate concepts which comprise a compound subject in any field of knowledge, which not only defines the special role of any concept, but at the same time also determines its citation order. And thirdly, we had examined systems of file organization, and had opted for a machine based kind of inverted file which allows access to any significant part of a compound subject by rotating its concepts so that they come one at a time to the first position. With such a file, the subject as a whole is presented at every point, yet the original relationships can always be deduced, either by referring to the operators, or more simply, by considering their citation order.

This is obviously the right time to leave this rarefied atmosphere of theoretical classification, and return now to the practical problems facing the indexer dealing with document descriptions for the MARC record. If you remember, we left him at the point where he has established the concepts which are present in a compound subject, and he also knows the relationships which exist between them. But he still faced three particular problems—first, he required a system for vocabulary control; secondly, he wanted a formula for ensuring consistent citation order; and thirdly, he required a machine system for generating index entries under any required lead term which will also offer the user a full subject statement at every point. Obviously the time had come for a merging of interests between these two separate research projects—indeed, it became apparent very quickly that it no longer really mattered whether one regarded the classification system as a model for indexing decisions, or the indexing system as a verbalized statement of the classification.

The product of this merging is the computer-generated subject index system we call PRECIS—for 'Preserved Context Index System'—of which a sample is shown in the appendix (see p. 491), and I should like to finish by explaining briefly the stages which lead to the computer production of these index entries, and some of the characteristic features of the entries themselves.

In this system, indexing is seen as a two-stage process, the first being one of concept analysis in which operators are used to establish the role played by a concept in the subject as a whole, and which also determines its citation order. This stage is represented by the initial concept string shown on your sheets. At the second stage, this string is translated into a manipulation string in which each term is preceded by a special code which can be read by the computer. Each number in this code represents a simple instruction to the computer, telling it, for example, whether or not to print an entry under the following term, and also how each term should be printed in the various parts of the entry. During the first stage, relationships are exactly conveyed by the operators, so that, for example, the concept 'Role' (see appendix) is defined by the operator (3), which conveys the fact that this can only mean the role of computers in manpower planning, not the other way round. However, since it is not intended that these operators should ever appear in the alphabetical index, this relationship has to be made clear in the entries themselves by using prepositions as part of a machine generated compound phrase, as in 'Role of digital computers' in the first four entries, which becomes 'Role in manpower planning' in the two final entries. The indexer's task finishes with the writing of the manipulation string, which is then keypunched ready for computer input. It is the computer, not the indexer, which then has the job of writing out and filing all the necessary entries.

It can be seen that the computer rotates terms through three basic positions in a PRECIS entry. Terms to the right of the lead position serve to establish, in progressive steps, the wider context in which the lead term is being considered, while those on the second line set out the narrower aspects of the subject in hand. So far as we know, this is the only index which deliberately uses a two-line structure to convey relational information in this way, ensuring that the user is presented with a full subject scan at each entry point without loss of the essential relationships. I should emphasize that the concept-in-context order which is established during the initial stage of analysis when operators are assigned, does not in any way impose an artificial classificatory order upon natural language elements. What does, in fact, happen is that, out of the many citation orders which are permitted by the inflexions of natural language, one only is consistently prescribed by the use of these operators. Because each term then establishes the logical context of the next term along the string, while this is itself within the context of the next term up the string, we have found that complex subjects can be readily comprehended under any entry term without the need for a fully structured sentence input and a full set of linking prepositions. This means that the indexer not only has the tight control he needs over citation order—he also has separate control over each of the concepts which comprise the subject. I said earlier that the one relationship which the operators are not intended to handle is the generic relationship, which in the classification scheme will be built into the structure of the basic thesauri and handled by a system of hierarchical and machine-readable notation. A parallel situation exists in PRECIS, in that higher generic terms are normally excluded from index strings, and are handled instead by a system of references. These too are shown on the handout sheets below the printed entries.

This is the system which we have been developing over the last year or so. It has now been submitted to testing across a wide variety of subjects, ranging from what I would call hard concept subjects, as in physics, chemistry and engineering, in which both terminology and relationships are normally clear and well defined, as well as in softer subjects such as sociology and education, where terminology is less precise and relationships are not always obvious. So far the results, in the form of index entries, have been very encouraging. Obviously many changes have occurred during this year of development and testing, and I should point out to anyone who has read the published accounts of the classification research, that the whole system of relational operators has been extended and modified as a result of this work on the index system. The operators shown on these sheets are the latest version in use at BNB, and incorporate some significant changes. The computer programme has also been modified a number of times, and is due for a final rewrite next month. We now feel confident that we have a system which meets the criteria laid down at the start of this talk. For the rest of 1970, the index system will be applied to increasing numbers of the books passing through BNB, and by January 1971, when we begin a new cumulation, we shall use PRECIS as our subject index system.

If I can now sum up. We see three great advantages of this index system. In the first place, it permits as great a depth of indexing as we achieved with the chain index, but allows us to offer a full subject statement at each step in the chain without losing either a ready understanding of the subject as a whole, or the essential relationships between concepts. Secondly, the indexer has a total control over the system, both in the terms he selects and those he raises as references. Thirdly, it ensures consistent indexing, so that the same subject might be indexed regularly by the same terms cited in the same order. But it does require an indexer trained in the techniques of concept analysis and string writing to handle the data and prepare the input, and it also obviously needs access to a computer and the appropriate programmes. It follows that this system is probably best suited to a large organization, or better still to a central index service taking data from a variety of other organizations. And like any other index system, it is bound to run better as it gets older, when large banks of authority files have been established. This is our greatest need at present.

APPENDIX

PRECIS Index

SUBJECT: 'Role of digital computers in planning the manpower requirements of British universities'

CONCEPT ANALYSIS: (6) Great Britain (4) Universities (p) Manpower (3) Planning (3) Role (2) Computers, digital

MANIPULATION STRING: $z101$a Great Britain $z101$a universities $z101$a planning $k manpower $z004$r role $s of $t in $z101$a computers $k digital

Entries:

GREAT BRITAIN
Universities. Manpower planning. Role of digital computers

UNIVERSITIES. Great Britain
Manpower planning. Role of digital computers

PLANNING. Universities. Great Britain
Manpower planning. Role of digital computers

MANPOWER PLANNING. Universities. Great Britain
Role of digital computers

COMPUTERS. Role in manpower planning. Universities. Great Britain
Digital computers

DIGITAL COMPUTERS. Role in manpower planning. Universities.
Great Britain

References

EDUCATION *see also* HIGHER EDUCATION
HIGHER EDUCATION *see also* UNIVERSITIES
COLLEGES *see also* UNIVERSITIES
EDUCATIONAL PLANNING *see also* MANPOWER PLANNING. Universities
LABOUR *see* PERSONNEL
STAFF *see* PERSONNEL
PERSONNEL *see also* MANPOWER
DATA PROCESSING *see also* DIGITAL COMPUTERS
ELECTRONIC COMPUTERS *see also* DIGITAL COMPUTERS

MANAGEMENT INFORMATION SERVICES

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TRADITIONALLY special libraries have developed collections of technical literature concerned with the products that are manufactured by the company or organization with which the library is associated. Until recently, if one went into the average special library—if there is such a thing—one would have found very few publications on the shelves on how to manage the company, how to evaluate the personnel and how to market the products. This restriction of special libraries to primarily technical information is in my view a short-sighted approach, as many of the important decisions which will affect, for example, research and development environment will be taken outside the r and d environment. It is obviously important for the library to ensure that a company is effectively managed so that such decisions prove to be correct. Librarians too rarely seem to be involved with internally generated information, and this also seems to militate against the concept of the special library as the memory of the firm. The librarian's skills of handling and disseminating information could also be applied to wider areas such as desk market research and personnel records.

If librarians were to extend their traditional role what are the key problems to which managers are currently directing their attention? If there is a correlation between a manager's reading habits and the problems that he is facing in his work, one simply has to examine a BIM publication *What Managers Read*,[1] in order to answer this question. The subjects attracting most attention at the time the survey was conducted were: general management, marketing management, management by objectives, case studies, the personal qualities of managers, stock control, long range planning, accounting, management development, computers, organization structures, incentive schemes, production control, job evaluation, organization and methods, market research, the management of research and development and productivity agreements. Now assuming that there is this correlation, what I propose to do is to run quickly through the literature of management especially those items pertinent to these topics, and also discuss some of the other information resources at the BIM. You must excuse the sales promotion, but the majority of companies and organizations for which you work will certainly be members of the Institute, and these facilities are often neglected simply because of ignorance of their existence.

One of the first problems when discussing management is how to define it adequately, and the main subject areas which the Institute covers in depth are general management: the management of the four major functions—production, personnel, finance, marketing, and management techniques. As in most special libraries however, if I may be permitted to generalize again, it is the fringe areas such as statistics and economics that cause most of our book selection problems.

The literature of management is jargon-packed, and it is very difficult for the beginner to cut his way through this jungle. Let me however recommend a few basic tools: *A Management Glossary* by H. Johannsen and A. B. Robertson,[2] which was the first glossary to be published in Great Britain covering the whole management field. The definitions are brief and can be understood by the non-specialist. A complementary volume is Heyel's *Management Encyclopaedia*,[3] an American publication again in one volume, which provides more detailed definitions. If you are doubtful as to what textbooks to buy, then you can obtain a copy of the BIM's *Basic Library of Management*,[4] which is revised every two years, and presents a skeletal list of the significant books, with heavy emphasis on UK material. The majority of items quoted in this publication are still in print. In addition, the BIM has produced over 150 reading lists which can also be used as more detailed selection aids on specific subjects.

I expect most of you will be familiar with *Management Abstracts* and the very useful commercial service known as *Anbar Abstracts*. One word of warning, these publications should not be used as retrospective searching tools in the way that one would use *Chemical Abstracts* to obtain a comprehensive set of references on a particular subject, because both of these publications are highly selective. This is not, however, a serious disadvantage, as the whole emphasis in management documentation is on relevance and not recall.

Selection of periodicals is always a problem, and the BIM is currently subscribing to some 550 titles, but the Institute has published a list of holdings,[5] which can be used as a selection guide. There is one excellent guide to the literature of management produced by my predecessor, Ken Bakewell,[6] and if people wish to acquire literature of management on any kind of scale, then I would certainly recommend a look at this publication.

In addition to the orthodox book and periodical literature the BIM Library also keeps examples of internal company documentation such as job specifications, organization charts, suggestion scheme booklets, performance appraisal forms, application forms etc., which can often be helpful to your own company's executives when they are designing their own documentation or are formulating a particular policy. These samples of company documentation are often acquired as a by-product of our research surveys which analyse UK member company practice in certain specific areas; recent surveys just issued cover the subjects of fringe benefits, organization structures and salesmen's incentives. The BIM is also the agent for National Industrial Conference Board publications which consist in the main of similar analyses of US company practice, and, as it has recently been estimated that some 20 per cent of UK companies could possibly be owned by American companies in the not too distant future, then these research reports will inevitably become an increasingly valuable information resource.

To digress a little, the BIM's internal publishing programme consists of the surveys already mentioned, information notes which explain management techniques in lay terms, checklists: a series of usually thirty questions on a given topic, such as metrication, guidelines for the smaller business and, finally, information sheets which either summarize recent Government white papers on management topics, or provide factual information on sources of information outside the Institute.

Now to revert back to the information services, there are three other sources of information within the BIM which are integrated with the Library and Information Services. First we have an Executive Remuneration Unit which advises member companies on the kind of salary levels that they ought to be paying. The salary levels go up from first line supervisor grade to chief executive. The BIM produces a salary survey every two years and this is supplemented by a great deal of valuable salary survey material published by other organizations.

We also have a Management Consulting Services Information Bureau which is jointly sponsored by the Confederation of British Industry and is, incidentally, available to all bona fide enquirers irrespective of membership of either the Confederation or the BIM. We have some 1,400 consultancy organizations on file, and we are quite happy to answer enquiries about specifically named firms of management consultants, as well as to provide a short list of suitable consultants for a specific assignment. Our recommendations are based not on what consultants claim they can do, but what in fact they have substantiated by way of user assessment reports. A checklist on the use of consultants and a leaflet describing the Bureau facilities in detail are both available free of charge from Management House.

Finally, we have the Management Education Information Unit which has information on some 7,000 courses that are going on up and down the country, including 700 or so which are organized by the BIM. In January of this year we launched an assessment scheme which evaluates these courses on the basis of user assessment reports.

It is with some diffidence at Cranfield that I venture now to discuss the question of information retrieval, but perhaps I can briefly outline some of the devices that we use within the BIM. After some considerable research we decided to produce a thesaurus of management terms to overcome some of the retrieval problems that we were experiencing at the Institute, and we were fortunate in obtaining a grant from the Office of Scientific and Technical Information to develop this vocabulary. The vocabulary is a structured one consisting of some 1,600 or so terms and has recently been published.[7] We did subject the system to some fairly rigorous testing on the lines of a similar test that I conducted on a metallurgical vocabulary.[8] Unfortunately, with the relatively small number of documents indexed at the time the test was conducted (2,000), it was decided that the results were not sufficiently conclusive to publish, although they did provide us with considerable assistance in the overall design of the system. What is the optimum size of a document test collection is an interesting question in itself, as, although the work of Professor Salton at Cornell in testing the effectiveness of automatic systems is undoubtedly of value, the documentation test collection size tends to be very small. I recall a figure of eighty documents being quoted by Michael Keen at the Harrogate Conference.[9] What we did find, however, was a much higher incidence of single subject searches than we had anticipated and this, of course, invalidates to some extent our decision to adopt a post co-ordinate indexing system. However, another of our reasons for adopting such a system was the greater degree of specificity that such a language can achieve, and this certainly has been borne out in practice. The vocabulary was originally used for indexing periodical literature as we assumed that periodical literature tends to be more specific and is, therefore, more suitable for answering the more detailed and complicated type of enquiry. This, however, is a somewhat arbitrary decision and, ideally, we would like to be able to use the UDC for single subject material, and the peek-a-boo system for the remainder of the input to our systems. However, because of the difficulties of storing books and periodical articles in a random sequence, it has so far not been possible to put this into practice. The vocabulary is now also being utilized in our Management Consulting Services Information Bureau where we are indexing the user assessment reports on the effectiveness or ineffectiveness of a management consultancy investigation.

In addition, we are employing the thesaurus in a rather unusual way in our Management Education Information Unit, where the vocabulary is being used as a conventional subject headings list. This is primarily because we required a much greater 'browsability' element in our system to cope with the different type of enquiries that we receive within this Unit.

I should also mention one development outside the BIM, in that Ken Vernon of the London Business School has developed a faceted classification scheme for business studies.[10] The provisional scheme is also being used at the Manchester Business School.

The resources that I have mentioned are useful in terms of assisting the executives within your organizations to improve their level of managerial performance, but many of these principles and techniques can, of course, be applied to library situations. The literature even in this rather specialized area is growing fairly rapidly, but as a starter I would certainly recommend the publications by Docherty and Heinritz,[11] for the mathematician the book by Morse,[12] and in particular the excellent introductory article by Simpson on the systems approach to library problems.[13]

At the Aslib Annual Conference that was held in Canterbury Professor Tom Allen gave a brilliant paper on the organizational aspects of information flow in technology.[14] I am sure that when you examine some of the management publications to which I have referred and, in particular, to some of these that discuss the application of these techniques to library situations, you will either tend to think that all of this is just common sense or you will be unable to convince the people for whom you work that this is not all a waste of time. I think Allen's paper is one of those studies that can be quoted against this sort of argument as there always appears to be a gulf between what your critic thinks is happening and what in reality is happening. Now Professor Allen looked at a number of projects that were being conducted in the American Space Programme with particular reference to the way information was imparted and he asked a number of the scientists involved in this work to list in order of preference the sources of information that they found most valuable. He listed a great number of these including contacts with colleagues, attendance at conferences, attendance at professional meetings, use of the library, use of abstracts, use of current awareness services, etc. What the scientists did not realise was that they were also being observed by a team of behavioural scientists. When the research was completed they found that there was little or no correlation between what information resources these scientists had stated that they had found valuable, and those sources that they had actually used successfully in practice, and I consider that this is the whole justification for the use of the systematic approach, not only to the management of a company, but also to the management of library operations. If I can paraphrase Coleridge: 'Experience is a wonderful teacher, but the tuition fees are somewhat exorbitant', and this is the rationale of not only management, but also of library and information work.

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UNCO-OPERATION BY (AND BETWEEN) LIBRARIANS AND INFORMATION WORKERS

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Introduction

THIS PAPER is an expanded version of the second part of my paper on 'Unco-operation' given at the Aslib Annual Conference, 1969, the first part of which, dealing with unco-operation in general, has already appeared.[1]

The Conference was kind enough to laugh heartily at some of the stories I told. (They were what stage folk call 'a lovely audience'.) This put me on my mettle in expanding part two of the paper, because funny stories are not nearly so plentiful about unco-operation in this special field. For weeks, in fact, I asked almost every professional colleague I met whether he or she knew of any stories illustrating my theme. I heard very few, and they were all about the awkward ways of customers. There may be a moral here, but I leave it to others.

I thought in fact, of opening this paper by quoting the Prologue to Shakespeare's (or Fletcher's) *Henry VIII*, which was produced immediately after the two parts of *Henry IV*:

> 'I come no more to make you laugh. Things now
> That bear a weighty and a serious brow
> . . . I now present!'

But I can promise that humour will break through now and then.

It is a sign of maturity in professions like ours to consider honestly, now and then, where we fail our customers, and what we ought to do about it, and then, of course, to *do it*. Note that I call them customers, not patrons, readers, clients, or any other glossy word. Although no money normally changes hands, the people who use our services are our customers, and if we fail them through our own fault, we are not earning our bread and butter.

Where then, are we failing?

Catalogues and indexes

Papers, too numerous to cite, have shown that these do not meet customers needs, that they find them confusing, and do not use them. We all know this, and that the effort we put into them is not repaid in use by readers. Freud's 'pleasure principle' says that people will do something more often and better, if they get pleasure out of it. Who ever got pleasure out of using a library catalogue, except a cataloguer? If people don't get pleasure out of doing something, the law of least effort says that they will put as little effort into it as they have to, and this may mean not using it at all.

We are hampered by the traditional forms, especially as we mostly inherit our catalogues. For those who do not, is there any alternative to the card or sheaf forms? There are strip indexes of various kinds, on hinged panels. For anything but a small library these need a good deal of room. I once visited an industrial library all of whose catalogues were in hinged-panel form. It was a brave experiment, but not one I wished to emulate. Who can say at the foundation of a library that it will never grow above a certain size? Perhaps book forms of strip index are better; I have no experience of them.

I personally find sheaf catalogues more difficult than card catalogues. They usually close when you let go of them to make a note, the paper is thin and curls at the edges, because the difference in size between posts and holes always allows overlap.

With a card catalogue you can at least (if you are staff) remove the rod, and take out a bundle of cards to look through. One can abolish rods, of course. I tried this once, in a research institute library, and found that main entries increasingly disappeared, having presumably been taken to put in private indexes.

It is important to see that card drawers are not too full. All too often one has to use considerable force to part the cards enough to read even part of the entry, and all too often the rearmost cards go so far back that one has to scrabble inside the drawer opening to get them. In these days this is normally inexcusable. Then one needs to make notes, and the pull-out shelves sometimes provided are always at the wrong height. It should be possible to remove drawers (they must then have rods), take them to a nearby table, and sit in comfort. Far too many catalogue drawers have only one, two, three or four tab cards; why should the customer have to waste a minute or so getting to the right place? I think there should be at least one tab-card per inch.

Instructions, as clear and simple as possible, for using the catalogue, should be close at hand. At Pressed Steel Fisher Ltd (my last job) they were typed on an electric typewriter, and framed, with a plan of the library showing where various kinds of stock were kept, over the catalogues. There is an old story of a man who saw in a catalogue the instruction: '*See* School of Oriental and African Studies', went to the counter, and asked for its address! When told that the card meant that he should see under that heading in the catalogue he replied: 'Well! If that's what you meant you should have put "see under" ' I can't help thinking that he had a point.

Very rarely does one see any instruction how to find the book from the card; there may be several classification symbols and the user is expected in some mysterious way to know that the book will be found at the left-hand class-number, or whatever place it is. The National Reference Library of Science and Invention (Bayswater Division) has stamped on its cards the word 'Location', an excellent idea. Some libraries distinguish pamphlets with a P in front of the class-mark. The customer all too often finds what this means only when he has searched fruitlessly along the bookshelves, and asks an assistant, who imparts this vital fact, often with a contemptuous sniff. (No, I am not making this up! I was such a customer.)

Classified catalogues

All the above applies, with redoubled force, to classified catalogues. It is, of course, rarely the librarian's fault that they are usually based on obsolete classifications. It *is* the librarian's fault if he is quite unaware of this. A few librarians really seem to think that the Dewey Classification reflects the present day 'order of knowledge'. It does not! It is nearly a century old in its basic outline, and looks it, as does UDC.

The instructions should set out clearly the advantages of this type of catalogue, how to use it, and its indexes, and an outline of the main classes. A copy of the full schedules must be available for reference, and bear an explanation that not all the subjects shown in it will be found in the library. In showing newcomers round the library, explain how easy this kind of catalogue is to use once you understand the basic idea. Draw the parallel between the notation and telephone or car registration numbers. If people who wanted to telphone me had to dial '60 Woodcote Valley Road, Purley, Surrey', either that way or in reverse, Bell, Edison and Fleming would have lived in vain! I am represented by a notation, which my friends remember. Anyone interested in a subject can remember its notation.

Drawers and tab-cards often bear only symbols which might as well be Choctaw or Sanskrit for all they convey to the layman. There is room only for short names, e.g. 'Chemistry', 'Biology', but they, at least, can be added.

The real aid to the user is in plentiful guide-cards, by which I mean cards, preferably of a special colour, at the beginning of every subject, telling the user what the notation means, referring him to allied subjects separated by the classification, and if possible, setting out the major direct divisions of the subject. At Pressed Steel Fisher Ltd, there was a guide card *for every distinct simple notation* (I had made my own classification, which used the colon as UDC does, and by 'simple' here I mean uncoloned) and even for a few very important coloned notations. Moreover, every notation which had three or more first-order divisions in the catalogue had these set out on its card. It took a lot of work, and I do not urge everybody to go to these lengths, because in some information departments it would be impossible, but I think it was worthwhile. (Incidentally we permuted all coloned notations with up to three elements, because one can always make six cards; it is rarely economical to make and file twenty-four, so notations with four or more elements were 'rotated', with some extra entries where necessary to bring together concepts likely to be looked for in association, but separated in the rotated numbers.)

Such a system makes it possible for a user who does not know the classification at all to find the broad subject which includes what he wants, and successively narrow down his search, *easily and quickly*, until he finds what he wants, if it is in the catalogue.

Some of my readers may be feeling that what I have said so far is exaggerated and unnecessary. We tend to assume, especially if we have been in information work since leaving school or university, that notions familiar to us are equally familiar to our customers. They are not!

Every specialist has his own egocentric classification in his head, with his speciality in the middle, other interests round that, fringe subjects in the next rings, and the rest nowhere, because he is not interested in them. Specialists tend to think that libraries use unnecessarily complicated classifications. Simple systems meet their needs as individuals; they do not meet their collective needs.

This point must be got over to them. In a research environment I used to say to them: 'It's no use expecting us to use nice, simple classifications in an increasingly complex world, which you are helping to make more complex and specialized every day.'

Perhaps I may tell a story about myself, in what seems now a previous incarnation. When I was a young chemist in the thirties, I used mainly the library of the Chemical Society, and the public library of my rather small home town. The former got along in those days with no numbers on the backs of books at all, so I had no reason to suppose this was necessary. (The present Librarian, Mr R. G. Griffin, hearing me say this at the Conference, told me afterwards that he wished in many ways that it were still true.) The public library used Dewey, of course. There was nothing visible to tell you what all these numbers meant, except a sign or two saying, for example '600. Useful arts'! I had never heard of useful arts, and if I had, I should not have associated them with applied sciences, which the class mostly deals with.

I could see that these numbers controlled order, and might have some hazy connection with subjects, at least in a librarian's mind. With the superb conceit of the young, I concluded that if that was the best way librarians could think of for keeping books in order, it didn't say much for librarians! I was not interested, you see, in their problems. I simply wanted to find books, and my own rough-and-ready methods were good enough for that. If the penny (in the form of close correlation of numbers and subjects) were ever on the point of dropping, finding football or photography among the 'fine arts' or mathematical statistics treated as a 'social science' would have been quite sufficient to prevent it. The staff clearly assumed that we were all as familiar with DC as they were. Only in 1946, when I began to study for examinations in librarianship, did I have a Pisgah-view, not, like Moses, of the Promised Land, but of an antiquated map of the world of knowledge.

The making of classifications of a subject in which research is going on is as much a contradiction as making a map of a territory still being surveyed. It serves as a useful aid only if kept as nearly up to date as possible. Revision by national (and still more by international) agreement takes far too long, and produces unsatisfactory compromises. That is why I believe in the 'do-it-yourself' approach. In a special library context, I should only make a classification for books and those few pamphlets best kept in subject order. It does mean some reclassification of stock when you alter the classification. For papers, preprints and specialized material I prefer 'keyword indexing'.

Catalogue entries for periodicals

Entries of the type: 'Journal of . . ., vol. 1– (1899–)' are not much help to the man who wants to know the last issue, or index, received, and when the next is expected. This information is always available, usually in a back room, where periodicals are 'booked in'. There is no real reason, in most special libraries, why this record, and perhaps others[2, 3] should not be in the reading room, perhaps combined with a special catalogue of periodicals.

Incidentally, while I am on periodicals, binding times are often far too long.

Guiding

This has improved greatly, but does not always extend to having a plan of the library, coloured perhaps to show where different kinds of material are kept. Shelf-guiding should show, at a break in the sequence, where it carries on. Where a publisher has been silly enough to issue a book with a sizeable spine, but with no title on it, we should surely rectify this.

Enquiries

The need for subject knowledge in handling these is increasingly recognized by Aslib members, but still denied by some. If a technical man or a scientist asks for information on a subject, you must know the meaning of at least the most important terms he uses. You can ask him what he means by minor terms, but if he suspects that you do not understand what he is talking about he will have no confidence in any information you supply. When I was a library student I was told to go round the corner and look up in encyclopaedias any terms I did not understand. This is generally nonsense. They are often not in the encyclopaedias, and even if they are, without some knowledge of the subject you probably will not understand the explanations. It is better to pass the enquirer on to a colleague versed in the subject. If one is not available I suggest you explain this, confess your ignorance, ask the enquirer to explain his problem in the simplest terms, and say that you will do your best. A brief talk with another expert may help. All this assumes of course that the enquiry is a fairly complex one.

Regulations

Like many other things, these have to be different, and differently enforced, in the various kinds of library and information department, and especially different between libraries serving the general public, and special libraries. All my work has been in the latter kind. I have always said: 'We have as few rules as possible and will gladly bust any of them if I think the circumstances justify it.' Our customers tend to think of us (and not always without reason) as hide-bound creatures, who put our own convenience before their needs.

I owe the following story to Jack Sharp, of ICI (Fibres) Ltd. One of his senior information colleagues entered a public reference library to look up a telephone number. He was accosted by a janitor who told him that cases and bags could not be taken in, so he handed over his case, first removing his camera because of its value. He was then told that it was not permitted to take a camera into the library, and after some discussion he agreed to leave it if he was given a receipt. This was forthcoming and he was allowed to enter the library. No sooner had he approached the shelves, than a member of the staff pounced on him, who required that he enter his name and address in a large book before using the stock. He was at last able to look up his telephone number, and thought that all was well. It was not, for another member of the staff upbraided him for returning the directory to the (correct) place on the shelves instead of leaving it on the table!

Some of these rules were necessary, some not. It is difficult to do much photocopying with a hand camera without accessories and anybody doing it would be easily spotted. Was it really necessary to ban cameras? Could customers not be asked to write their names and addresses while the janitor was putting away their possessions and giving them the token? We all know the difficulty caused by users mis-shelving books, but surely a gentle request to leave books in future on the table would have sufficed. Clearly these rules had never been looked at as a whole, or from the customer's point of view, and that library irritated a friendly customer to no purpose.

Jargon

Some of us are apt to use advanced technical terms to people who do not understand them. There is a story of an information service (I believe in the USA) which served the building trades, and which put out leaflets or newsletters. One of these, intended for plumbers, dealt with the use of muriatic acid (which is plumberese for hydrochloric acid) for cleaning lead pipes. It said that its use was deprecated, because it was noxious to human beings and had deleterious effects on the pipes. This produced a letter from a plumber who said that he had always used the stuff, found it jolly good, and was delighted to see that the information service agreed! They wrote back saying that its use was inadvisable as it had adverse effects on pipes and human beings. The plumber replied that this only went to show how right he had been, and he would go on using it. The information service finally lowered itself to using basic English and wrote: 'Dear Sir, Don't use muriatic acid! It eats hell out of the pipes! Yours truly'.

Then again, we are apt to use our own professional jargon to customers, sometimes with unfortunate results. Acronyms like LADSIRLAC and HERTIS mean, of course, nothing to laymen. UDC means Urban District Council to most people. 'Accessions' is not understanded of the people, whereas 'acquisitions' or 'new material' are. To use 'charging' for 'issuing' or 'booking out' a loan may make the customer think there is something to pay. A scientist will nearly always know what you mean by 'abstracts' but an engineer, especially if young, will probably not, as the following story, told by Dr Urquhart, will show. The Science Library once lent an engineering periodical to a Government establishment and received it back with one article cut neatly and entirely out. A pained letter went off, saying that if this happened again the establishment would lose the privilege of borrowing. After a week or so, the Science Library received a letter with meek apologies, in fact almost crawling. It said that the periodical had been given to a young engineer with a request to 'abstract' the article!

The need for friendliness and accessibility

I think we should greet our colleagues and customers with a smile (which after all costs nothing), and if you see them seldom, their name. To many people, nothing is so important as their name. Tradesmen know this and use it. My tobacconist in Oxford sometimes did not see me for weeks, but when I went in to the shop he said 'Good morning, Dr Campbell', and went straight to the tins of my favourite brand.

Good layout can help in this too. At Pressed Steel Fisher my office door was just by the entrance to the Information Section, and was always open, except when I was talking about something secret. From my desk I could see anyone who came in, and seemed uncertain what to do. I would go out, introduce myself if we had not met, and say 'Can I help you?' There was also a notice which told people which member of the staff to see for particular purposes, and where that member worked.

In libraries where it is not obvious who the staff are, they could be identified by labels on their lapels or desks. It is embarrassing to accost a fellow customer in mistake for a member of staff.

In special libraries and information departments, it helps to have, occasionally, meetings with colleagues. These should, I suggest, be limited to fifteen or twenty people, and a senior person should be asked to take the chair. Ask them how satisfied they are with the service you give, and ask for frank comments and criticisms. People love being asked what they think of things, and are delighted that you care. All the points should be recorded, and answered if possible. If you cannot answer them, accept them gracefully and promise to consider them, unless they are quite impossible. We are all prone not to see the wood for trees, and sometimes even the branch for twigs. Sometimes customers have bright ideas. Ensure that something is done, wherever possible, *and that the suggestor knows what it is.*

Again, it may be possible to run short courses for users. Let them suggest the practical work as far as possible, so that it can be on something connected with their work.

Lack of helpfulness, courtesy and patience

We should never lose patience, even with the most awkward customer. Shop assistants have to keep patience with women who try on practically everything in the shop.

Mr F. W. Clifford, who was Librarian of the Chemical Society from 1903 to 1942, once told me a story which points this moral. As I have explained in a note to the first part of this paper, the Civil Service in World War I included hardly any scientists or technologists, and the numerous technical problems which the war posed were usually referred to the appropriate learned society. One day a junior civil servant came in and asked Clifford whether he knew of any grounds for thinking that sodium hyposulphite or thiosulphate (photographer's 'hypo') was liable to spontaneous combustion. A cargo of the stuff had been lost, in mysterious circumstances, and the Ministry had thought of this explanation. Mr Clifford did not know of any grounds, and spoke somewhat as follows: 'It's a mild reducing agent, but that would surely not make it go off; moreover it's got five molecules of water of crystallization to each molecule of hypo, which makes it even less likely.' (I hope he explained these technical terms!) However he took his enquirer to the reference shelf and consulted chemical encyclopaedias, treatises on inorganic chemistry, etc., none of which gave any support to the idea. The young man went away satisfied.

Next morning two more senior 'men from the Ministry' appeared, with highly dissatisfied faces. They had heard their junior colleague's report, and frankly, did not believe a word of it. Clifford went through the same steps as before. They remained unconvinced. 'We've found out' said one 'that this stuff contains sulphur and oxygen, and when they meet, we know, things are likely to happen'. Mr Clifford, after, I suppose, casting a glance heavenward in hope of aid, explained that in hypo, these elements *had* met, and tried to explain the mysteries of chemical combination. On the same argument, water would be a highly explosive gas, instead of a stable liquid used to put out fires. His enquirers left, apparently, if reluctantly, convinced. The next morning a pompous voice on the telephone said 'This is the Ministry of . . .' and posed the question yet again. Clifford went through the familiar routine, to receive the reply: 'But you can't be certain that hypo never spontaneously explodes, can you?' The sorely tried Librarian (running a library almost certainly seriously understaffed) himself exploded, and replied: 'My dear Sir, I've never been to the moon, but I'm pretty sure it's not made of green cheese!', before slamming down the receiver. Next day two more civil servants appeared, who said, in awed tones: 'That was the Minister you spoke to yesterday about hypo. He did not like your reply.' And poor Clifford had to go through it all again!

Man has now been to the moon, and the experts are still arguing about what it is made of, but green cheese has not, I think, been mentioned.

When searching for funny stories to illuminate this paper, I even went to a well-known reference library. I asked an assistant on the counter for books of funny stories. She took me to the shelves and showed me a few books of humorous verse. 'No' I said, 'funny stories, anecdotes, jokes.' She appeared not to understand, which, as she seemed to be Chinese, I put down to language difficulty. She shrugged her shoulders and walked away, without telling me where. After a few minutes I approached the only other assistant on duty and told her what had happened. She understood me, but said, with a disapproving look, that books of funny stories were so seldom asked for that they were kept in the store. Her tone implied that I must be a pretty low fellow to want such things. She disappeared. After a few minutes they both appeared bearing half a dozen books of funny stories, and the second assistant told me off roundly for taking two assistants off the counter, and said: 'If another enquirer had come in there would have been nobody on the counter.' The library was singularly slack, and I began to see why.

Unco-operation between libraries and information centres

Giving wrong references for loans is bad, but sometimes unavoidable because of lack, in small libraries, of reference tools, or even time. The annual report of the National Central Library for the year ending March 1969 speaks of 'the disappointing standard of bibliographical verification carried out in libraries'. It is a good idea, I suggest, always to give the author's name, or the first words of the title; then, if your reference is wrong, it can be spotted, and expense on postage or photocopying spared. Some authors one could name are appallingly careless. One develops, with experience in a given field, a 'sixth sense' for wrong references.

Not returning borrowed material properly packed or labelled is a grievous sin. Not returning it on time is less heinous, and which of us can say he has never been guilty?

Asking for information without using your own resources is also asking for trouble. The answer may come back: 'You'll find it in Whitaker's Almanack' or some equally universal work. You lose face and reputation. I know. I did it, once!

Asking for information without giving a list of the main sources tried, or how far back you have looked in indexing or abstracting periodicals, makes your helper repeat much of what you have done.

Some information centres and libraries, according to colleagues, are very bad at answering letters; I cannot say that I have found this.

But perhaps the ultimate, most unforgivable crime is to send, to several different information centres, identical requests for information at the same time. This is rare, I think, but it causes unbelievable waste of time when it is done. I had a request, two or three years ago, and rang a colleague who, I had reason to think, might have the answer in his head. He said: 'That's funny! I had the same enquiry this morning. Who's yours from?' It was the same organization. We were not amused. I wrote and told them so, and asked them not to send us any more enquiries, simultaneous or otherwise.

This idea might be legitimate in a desperate emergency, if you said that it *was* desperate, and gave a list of all the addressees. But except for very out-of-the-way information, it would mean a heavy loss of face.

General lack of the 'outside view'

Coming back to the relations between us and the customers we serve, many of the deficiencies I have described stem from the fact that many of us come straight into this work from school, library school, or university, and have little or no idea how the rest of the world views them. A spell doing other work, preferably professional, and using libraries as a customer, is a wonderful corrective. If it were possible for more people to have it, we might have fewer pleas for higher status in the correspondence columns of library journals: for I suggest that the status of a trade or profession depends almost entirely on the contributions its members are seen to make to the well-being of the nation, and the way to gain higher status is to improve our professional effectiveness.

These are my views on professional unco-operation. Others will have their own. Burns said:

> 'O wad some Power the giftie gie us,
> To see oursels as ithers see us!
> It wad frae mony a blunder free us,
> An' foolish notion:'

I have always been glad that I came into library and information work after fifteen years as a scientist. There is nothing like it, for fulfilling Burns' wish, for giving one what I call 'the outside view'. It does not, alas! give us the outside view of ourselves as individuals, or free us from all blunders and foolish notions.

I hope that these thoughts will not prompt anybody to think of me, as Burns said in his *Address to the unco guid*:

> 'O ye wha are sae guid yoursel,
> Sae pious and sae holy,
> Ye've nought to do but mark and tell
> Your neibours' fauts and folly!'

for the same poet bids us, as we grow older:

'Seek the chimney nook of ease:
There ruminate with sober thought,
On all thou'st seen, and heard, and wrought,
And teach the sportive younkers round,
Saws of experience, sage and sound.'

Some of the experience is in remembering my own blunders and foolish notions! I hope some of my saws, at least, are sage and sound, and helpful.

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THE PILKINGTON TECHNICAL COMMUNICATIONS SYSTEM

A Formalization of the Role of the 'Technological Gate Keeper'

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THIS PAPER describes the methods used by the Pilkington Group Technical Communications Centre to ensure that all staff in the Pilkington Organization have clearly defined and easily accessible means of obtaining technical information. As far as we are aware we are the first organization to try to formalize the concept of 'Technological Gate Keepers', who have been shown by Professor T. J. Allen to be the major means by which information flows within the organization. A 'Gate Keeper' is a person who is usually consulted by his colleagues for information; this consultation takes place as a first step in obtaining information and in spite of any other avenues open to the enquirer.

The nature of the problem

Pilkington recognizes that information is an important commodity which must be exploited and that every item of information should be analysed to assess its usefulness. There is therefore a need for clearly defined procedures whereby all information is gathered, appraised and disseminated and also for clearly established channels through which anyone within the organization may gain rapid access to technical data of potential value. This paper is concerned not with the methods for information gathering, storage and retrieval but with the lines of communication through which this information can be reached.

Development of the 'Gate Keeper' concept

Information exists in many forms, e.g. there is information gained verbally at conferences, that picked up during discussions with colleagues, 'know-how', i.e. the experience gained in doing a particular job, as well as information in the form of reports, journal articles, patents, standards, etc. To be useful however, information, no matter how it is obtained, must be communicated.

Professor Allen has demonstrated the role of the 'Technological Gate Keeper' and, from previous experience, it is our firm conviction that the most efficient and effective way of transmitting information is by the specialist talking to the enquirer about his enquiry, provided that the specialist speaks in terms meaningful to the enquirer. The provision of documents without a technical appraisal of these documents can lead the non-specialist enquirer to wrong conclusions. These ideas have led us to adopt the 'Gate Keeper' concept in organizing our technical communications system.

We were convinced that 'Gate Keepers' existed in many parts of the organization, but it was likely that there were several 'Gate Keepers' in very similar technical areas within research and development, perhaps fewer in the production areas and probably none in some technical areas. Such a random network would, we thought, be totally ineffective in forming the basis of a communications system for the Pilkington organization. All technical areas of interest to the organization were, therefore, identified so that a 'Gate Keeper' could be established in each. Since the term 'Gate Keeper' might not be understood by those unfamiliar with Professor Allen's work, we adopted the term 'Contact'.

Choice of Contacts

The criteria for choosing a Contact were as follows:

(a) Technical expertise—he must be a technical expert in the field in which he is asked to give advice.

(b) Personality—he must be approachable and co-operative.

(c) Accessibility—it would be pointless to nominate someone who spent long periods abroad.

As well as Contacts in specific technical areas, we felt that Contacts were also needed in each of the manufacturing divisions to provide information on divisional plans, production information, etc.

The number of Contacts was kept to a minumum and each was allocated a well defined area without overlap so that an enquirer would have one obvious contact for his enquiry and not several possibilities.

The selection of Contacts was considerably helped by the fact that in many technical areas specialists met together on committees, and membership of a committee was one way in which a Contact could keep himself up to date in his field. What could have proved to be a difficult part of setting up the system thus proved to be, in fact, fairly easy.

Contacts, at present, exist in each of the following areas:

Manufacturing Divisions
Specific Technical Areas
Group Research and Development
Central Engineering
Group Patents Department
Group Standards Department

Responsibilities of Contacts

The role a Contact was expected to play in the system was discussed with those nominated and it was agreed that each Contact should;

1. Provide information about any aspect of his technical area or guide the enquirer to the source best able to provide the information.
2. Maintain a record of the technical specializations in his area and the staff responsible for these specializations.
3. Ensure that all technical information generated within the technical area is communicated to the Group Technical Communications Centre for entry into the group technical information storage and retrieval system.

It will be noted that a Contact is not necessarily expected to store and retrieve documents other than those which he is handling for his day-to-day activities. This function is performed by the Group Technical Communications Centre.

A Contact is asked to provide complete, accurate and up-to-date information. This he can do both because he is an expert in his field, sits on appropriate committees, has the opportunity of travelling around the organization, attends relevant conferences, etc. and also because the Group Technical Communications Centre feeds to him relevant information which it receives.

The role of Group Technical Communications Centre

The Group Technical Communications Centre obtains, indexes, stores and retrieves relevant information produced inside or outside the Pilkington Group, disseminates information on a personal basis (with particular emphasis on dissemination to the Contacts), produces bulletins and provides answers to enquiries not within the province of any Contact or on behalf of a Contact at his request.

Information Officers of the Group Technical Communications Centre each have responsibilities for liaising with particular Contacts and knowing about the work and personnel in particular parts of the Pilkington Organization. They each, therefore, spend a portion of their time visiting those parts of the organization for which they are responsible.

Launching the system

A booklet was produced explaining the system and giving the names and telephone numbers of the Contacts and the areas for which they were responsible. This was widely distributed to technical staff.

Follow-up was necessary to ensure that staff had read the booklet, understood it and were prepared to use the system. Several meetings were held at various locations throughout the organization to present the system and to give staff the opportunity to ask questions and to relate the system to their needs and their environment. During the meetings great care was taken to emphasize that if an enquirer knew someone with the answer to his enquiry or if there was someone in the organization who usually provided help for him, then he should continue to use these sources. The system would help him if he had no person to talk to, if the person had changed his job or retired, or if, in this instance, he could not help.

To use this system an enquirer would:

1. Use the booklet to locate a Contact.
2. Get in touch with a Contact and detail his enquiry.
3. Get in touch with Group Technical Communications Centre if his enquiry lay outside the known areas of the Contacts.

The Contact would take action in one of the following ways:

(a) Provide the information immediately.
(b) Provide what information he had and arrange for more information to be given by a specialist on his staff or an associate.
(c) Refer the enquirer to particular reports, patents, journal articles, etc.
(d) Refer the enquirer to other Contacts or to Group Technical Communications Centre.
(e) Indicate that to his knowledge there is no information available to answer the enquiry. This may in itself be useful in that it highlights some area where we need knowledge so that some decision can be made on what effort, if any, should be mobilized to solve the problem.

The point about the availability of the Contacts is important since an enquirer need only fail to reach a Contact once or twice and he will not use the system again. To provide cover each Contact was asked to have a deputy to stand in for him. This would also ensure continuity should the Contact change his job or retire.

Conclusions

This paper has been in the nature of an introduction to the Pilkington system. It is too early yet to report on its effectiveness. In the setting up of a system like this, however, it should be noted that:

1. The backing of senior management is essential.
2. The personality of Contacts is most important.
3. It is necessary to sell the system to the potential user.

We intend to monitor and evaluate the system constantly and to change it where necessary for, as with any other information system, the personality of the people operating the system is as important as the system itself. Most important of all, however, is the user; without his interaction with system all else fails.

Acknowledgement

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Note: These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory.

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres, management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

JANET WALKLEY
Librarian

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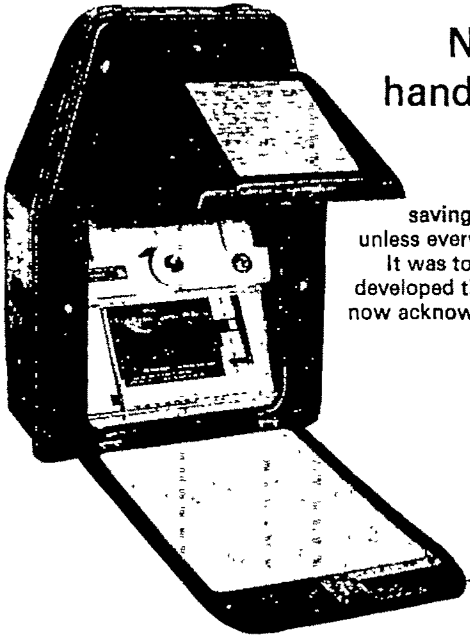

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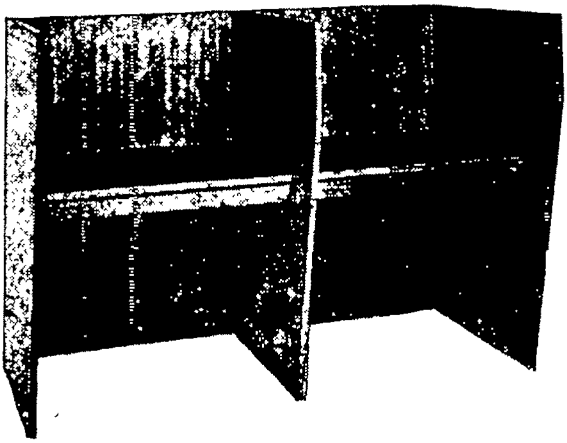

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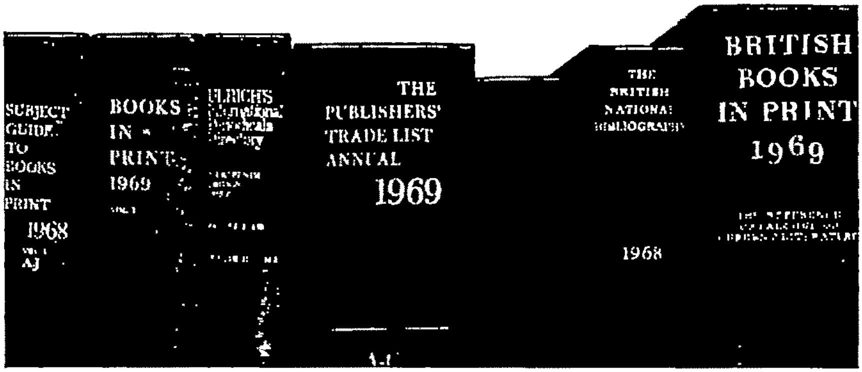
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THE PUBLISHERS' TRADE LIST ANNUAL 1969
THE BRITISH NATIONAL BIBLIOGRAPHY 1968
BRITISH BOOKS IN PRINT 1969

ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 22 November 1970 Number 11

ASLIB CALENDAR 1970

December

THU.3–SAT.6.	Audio-Visual Group/National Council for Educational Technology joint conference: 'Multi-media resource organization in higher education (for senior librarians and organizers)'.
MON.14.	Co-ordinate Indexing Group Meeting and Discussion: 'Sub-codes'. Aslib. 3.30 p.m.
WED.16.	Aslib Christmas Party. 5.30 p.m.
TUE.22.	Engineering Group Christmas sherry party and evening lecture. Aslib. 5 p.m.

1971

January

FRI.1–SUN.3.	Social Sciences Group Conference: 'Primary materials in the social sciences'. Loughborough University of Technology.
WED.6.	Chemical group wine and cheese party and evening lecture. Speaker: E. D. Wiggins (Fisons Ltd). Aslib. 5 p.m.
WED.13.	Aslib Midlands Branch/Institute of Information Scientists joint evening meeting: 'Locating key articles efficiently without subject expertise', by A. E. Cawkell. Arden Hotel, Birmingham. 6.15 p.m.
WED.20.	Aslib Evening Meeting. 'Library theory and practical vocational training: a forum.' Imperial College, London. 5 for 5.30 p.m.
FRI.22.	Technical Translation Group Annual General Meeting. Aslib. 2 p.m.

February

TUE.16.	Midlands Branch afternoon workshop: 'Innovations in libraries.' Arden Hotel, Birmingham. 2.30 p.m.
WED.17.	Aslib Evening Meeting. 'Systems Research' by Dr Gordon Pask. Imperial College, London. 5 for 5.30 p.m.
FRI.19.	Technical Translation Group meeting and lecture: 'Training translators for International Organizations' by Professor J. Coveney. Aslib. 3 p.m.
THU.25.	Aslib visit to NRLSI, Bayswater Division, London W2. 4.30 p.m.

New members

CORPORATE

(specialized Group interests are given after names, where relevant)

Name	*Locality*	*Representative*
Birmingham Post and Mail (*SSG*)	Birmingham	G. M. Adams
Boissevain and Osmond	Epsom	Mrs A. L. Sparks
Conran Design Group (*AVG, Co-ord Index, Econ, SSG, Tex*)	London	Miss J. Czertko
Crawfords Advertising	London	Miss E. Saunders
Datafax Ltd (*Co-ord Index*)	Richmond	A. Perodeau
Economist Intelligence Unit (*AVG, Co-ord. Index, Econ, TTG, Trans*)	London	M. J. Walsh
Ever Ready Co. Ltd (*Chem, TTG*)	London	P. S. Hunter
Faber, Oscar & Partners	St Albans	R. P. Bennett
General Foods Ltd	Banbury, Oxon.	W. J. Nightingale
HTS Management Consultants Ltd	London	A. Berkova
International Investment Corporation for Jugoslavia	London	R. F. Fellowes
Lloyds Bank Ltd (*Econ*)	London	J. R. Winton
Players Design Studio	Nottingham	D. V. Abdy
Powder Advisory Centre (*Chem, Eng, AVG*)	Newcastle-u-Tyne	A. S. Goldberg
Wears-Milne Ltd (*Co-ord Index*)	Richmond	A. B. Carley
Australian Consolidated Minerals	Perth, Australia	B. Summers
McKinsey & Co. Inc. (*Co-ord Index, Econ, SSG, TTG*)	Dusseldorf, W. Germany	Mrs C. M. Carter
The Brewers Society	London	D. Horwood
Cambridge University Library	Cambridge	E. B. Ceadel
Manchester University Regional Computing Centre (*Co-ord Index*)	Manchester	Miss E. A. Hunter
Swansea College of Technology (*Chem, Econ, Eltron, Eng, AVG, TTG*)	Swansea	R. L. Morse
Curso de Biblioteconomia e Documentacao	Parana, Brazil	M. D. Barbosa
Queen's University at Kingston	Ontario, Canada	Miss H. M. Smith
Ordine della Casa Matha (*TTG*)	Ravenna, Italy	G. Gamberini
Natural Resources Authority (*Chem, Eng, TTG*)	Amman, Jordan	Librarian
Commission des Communautés Européenes	Luxembourg	Miss M. Lehnen
European Translations Centre	Delft, Holland	G. A. Hamel
Institute of Technology	Benin City, Nigeria	W. J. Harris
Sveriges Radio	Stockholm, Sweden	I. Claesson
Southern Illinois University	Edwardsville, Illinois, USA	J. M. Smith

INDIVIDUALS

K. Ahmed	Bradford
D. Austin	London
J. Ballantyne (*AVG*)	London
G. Bridson (*Bio*)	London
R. E. Coward	London
F. R. L. Crompton-Roberts	London
Miss G. E. Faichney (*Econ*)	London
A. Fasler	Norwich
Miss P. E. Harewood	London
M. H. Heine	Newcastle-upon Tyne
A. P. Kelly (*SSG*)	London
G. G. Kinnane (*TTG*)	Orpington, Kent
Miss E. R. Noyes (*SSG*)	London
Miss M. E. Piggott	Wembley, Middx
D. W. Reap	Ruislip, Middx
P. G. Underwood	Romford, Essex
Miss D. Watson (*Co-ord Index*)	Chelmsford, Essex

G. Bricarelli	Genova, Italy	H. D. White	Berkeley, California
M. A. Carpenter	El Cerrito, California		

Social Sciences Group: 1st Annual Conference

Next January the Aslib Social Sciences Group is to hold its first Annual Conference, with the theme: 'Primary Materials in the Social Sciences.' Experts in six major disciplines within the social sciences will review the research materials in their subjects and discuss such questions as the extent of library holdings, problems of location and the adequacy of bibliographical tools. The speakers will be Professor George Bain of the University of Manchester Institute of Science and Technology (industrial relations), Professor Kathleen Jones of York University (social administration), Mr Peter Laslett of Cambridge University (historical demography and social structure), Dr Michael Rush of Exeter University (politics and political science), Professor Dennis Swann of Loughborough University (economics), and Mrs Brenda White, consulting librarian (urban and regional planning).

It is hoped to attract a mixed audience of academics and librarians, and to stimulate an exchange of views out of which may emerge something of practical value for the shaping of national library policy for the social sciences.

The venue is Loughborough University of Technology. The Conference will assemble at 6 p.m. on 1st January and disperse after lunch on 3rd January 1971. The fee for residents is £10 10*s*. Applications should be sent by 30th November 1970 to the Conference Organizer, Mr John E. Pemberton, Politics and Law Librarian, The Library, University of Warwick, Coventry CV4 7AL.

Chemical Group: 'INFOCHEM 70s'

Information and the Chemical Industry in the 1970's ('INFOCHEM 70s') will be the theme of the Aslib Chemical Group's 1971 Conference, to be held at the University of Surrey, Guildford, from 31st March to 2nd April.

A provisional programme has been drawn up and five sessions are planned. In the opening session, Professor F. R. Bradbury of Stirling University (Chairman), Dr Cyril Child (ICI Plastics), Mr K. J. S. Vasey (Fisons Ltd) and Mr G. Teeling-Smith (Office of Health Economics) will discuss 'Prospects for the Chemical Industry'. In the second session on 'Information services, national and international', speakers will be Professor C. Freeman and Mr R. Curnow (University of Sussex) and Mr P. Judge (OECD); and in the third session, Mr H. Johannsen (BIM) and Mr Kjeld Klintoe (Danish Technical Information Service) will consider 'Management techniques in information services'.

In session 4, Dr H. Coblans will chair a discussion on information services in which panels representing both services and users will take part. Finally, Mr Leslie Wilson, Director of Aslib, will give the last talk of the Conference on the theme 'The human factor'.

Further details can be obtained from Miss M. Wells, Central Market Information Unit, BP Chemicals (UK) Ltd, Devonshire House, Mayfair Place, London SW1.

Third Cranfield International Conference

The Third Cranfield International Conference on Mechanized Information

Storage and Retrieval Systems will be held on 20th to 23rd July 1971. Invited speakers will present papers dealing with the main theme of the Conference, namely the relationship between the large mechanized information retrieval systems covering a complete discipline, and the smaller specialized information services which may use their data bases.

A number of sessions will be reserved for contributed papers; such papers can either relate to the main theme of the Conference or to any aspect covering the design, operation or evaluation of mechanized information services. Enquiries or offers to present papers should be sent to the Conference Director, Mr Cyril Cleverdon, Cranfield Institute of Technology, Cranfield, Bedford, England.

CIB Conference on 'Information Flow in the Building Process'

The second conference on 'Information Flow in the Building Process' organized by CIB (Conseil International du Bâtiment) appeared to be more sure of its objectives than the previous meeting in Oslo in 1968. The first conference encompassed a very wide range of topics discussed in over sixty papers whereas the second was based on reports from seven working groups, each report being accompanied by supporting papers from invited authors. The seven sessions were devoted to:

1. System Engineering and Information Theory in relation to Information Flow
2. Review of existing Information Systems in relation to their suitability for operational use and the criteria that such systems should satisfy
3. The form and means of communication between the different participants in the building process
4. The form of recording site data to facilitate cost control
5. The form and content of the product file
6. A collection and evaluation of existing decision-making models in the Construction Industry
7. Co-ordination of software

The discussion between delegates from 23 countries was very lively, if at times somewhat diffuse. The final session discussed various recommendations for future action to be considered by CIB and these included:

> Work of group 2 to be continued in order to establish more definite criteria and obtain descriptions of many more Information Systems. (This work had been based largely on the approach devised by C. J. Wessel.)
>
> The development of an agreed format for trade literature. (In the UK the MPBW has just announced the award of a contract to Dargan Bullivant Associates to study this problem.)
>
> Compatibility between different Construction Industry indexing languages should be strengthened and furthered. (There is already a CIB working Party looking at thesauri.)

The conference was held at the Bouwcentrum in Rotterdam from the 14th to the 16th September, 1970 inclusive.

Periodical Publications in the NRLSI

The NRLSI has recently published *Periodical Publications in the National Reference Library of Science and Invention. Part 3. List of current titles in the Holborn Division.* It brings up to date and replaces the 1965 edition of *Periodical Publications in the Patent Office Library.* It contains details of over 10,000 different periodicals currently taken by the Holborn Division, all of which are readily available there together with years of back numbers, for study and research or as a source of photocopies by post.

The Library produced *Part 1. List of non-Slavonic titles in the Bayswater Division* last Autumn. Part 2, from Slavonic and East European countries, is promised shortly. Parts 1 and 3 are obtainable from: The Director (Publications), British Museum, London WC1B 3DG.

BHRA Abstracts Publications

The British Hydromechanics Research Association's Information Department compiles and publishes abstracts journals covering the field of fluids engineering, research and development. These are now available to non-members and comprise:

Channel: a monthly abstracts journal covering the world literature on civil engineering hydraulics; *Industrial Aerodynamics Abstracts*: a bi-monthly abstracts journal covering the world literature on non-aeronautical aerodynamics; *Tribos*: a monthly abstracts journal covering the world literature on bearings, friction, lubrication and wear; *Fluid Power Abstracts*: a monthly abstracts journal covering the world literature on all aspects of oil hydraulics and pneumatics; *Fluid Sealing Abstracts*: a monthly abstracts journal covering the world literature on static and dynamic seals and sealing materials; *Fluidics Feedback*: a monthly abstracts journal covering the world literature in fluidics.

In all cases the abstracts are listed under standard subject headings and cross-references where necessary. Author and subject indexes are supplied within the subscription. These abstracts journals are an invaluable aid to everybody engaged in information work in the field of fluids science. More information may be obtained by contacting: Publication Sales, The British Hydromechanics Research Association, Cranfield, Bedford.

Computer Checklist

The Library of Science, Technology and Commerce, a department of the Kingston upon Hull City Libraries, has recently published a 'Computer Checklist' which contains over 300 entries for books, periodicals and other material on computers and computer applications which are available for either reference or lending in the Central Library, Hull. The list is arranged by subject so that all the books on a particular aspect of computers, e.g. FORTRAN, computer applications to business management, etc. are brought together. All entries are up to date to the end of August 1970.

Copies are free of charge and are obtainable from the Chief Librarian, Kingston upon Hull City Libraries, Central Library, Albion Street, Hull.

Queen's University, Belfast: Research Grants

The School of Library and Information Studies, Queen's University, Belfast, has been awarded £1,500 by the Social Science Research Council and £250 by the British Academy, to support the compilation of a subject catalogue and breviate of Irish parliamentary papers, 1921–70, by Mr A. Maltby, Lecturer in the School.

The subject index and breviate will be similar to those compiled by P. and G. Ford, for British parliamentary papers, and will include the papers of both Northern Ireland and the Irish Republic.

Resource-Centres Project

The University of London Institute of Education Library has received a grant from the Schools Council, to undertake a research project into the problems faced by schools and local authorities wishing to develop resource-centres.

The project, which is designed for one year, will be directed by Mr D. J. Foskett, Librarian of the Institute. Norman Beswick, recently returned from 14 months library-school teaching in the USA, will carry out the project as Research Officer.

The research aims at identifying problems found in resource-centre provision and determining what have been found to be the most practicable solutions. Special attention will be paid to indexing, storage and retrieval systems.

It is known that much exploratory work is proceeding, in schools, colleges of education and local authority teachers' centres, among others, and the project should help to co-ordinate experience and help in the dissemination of useful knowledge. Interested teachers and librarians should write to Mr Beswick at the University of London Institute of Education Library, 11/13 Ridgmount Street, London, WC1.

British Computer Society

The British Computer Society have organized a visit to Service in Informatics and Analysis Ltd, Ebury Gate, 23 Lower Belgrave St, London SW1, to be held on Tuesday, 15th December, at 6.45 p.m. As there is a limit on the number of people allowed for this visit, only the first thirty applications will be accepted. If sufficient interest is shown to justify a second visit, it will be organized for the end of January 1971. Applications to: R. D. Kerr-Waller, STL Ltd, London Rd, Harlow, Essex.

Processing non-book materials

At the 1970 Detroit conference of the American Library Association, the Executive Committee of the Cataloging and Classification Section of the Resources and Technical Services Division endorsed a recommendation of the Section's Audio-Visual Media in Libraries Committee, by voting to accept the publication, *Non-Book Materials: The Organization of Integrated Collections*, published by the Canadian Library Association, as an interim guide for the cataloguing of non-book materials, with the proviso that a permanent ALA/CLA committee be established to work on any necessary revision for the final edition and its supplements.

LIST 1971–Library and Information Science Today

As announced in the March 1970 issue of the *Proceedings*, the University of Maryland's School of Library and Information Science have been preparing a new and comprehensive list of research activities in librarianship and information science. The project has been completed and publication of *LIST 1971—Library and Information Science Today* has been announced for this month (November).

LIST 1971 contains details of over 800 research projects involving more than 1,500 library and information science personnel throughout the world. The managing editor is Mr Paul Wasserman, Professor and former Dean of the University of Maryland Library School.

The book costs $25 and may be ordered from the publisher, Science Associates/International, Inc., 23 East 26th Street, New York, NY 10010, USA.

Language and Automation

Language and Automation is a quarterly, annotated bibliography designed to meet the growing demand for substantial, timely coverage of the literature dealing with the interfaces of linguistics, computation, information science and related fields including theoretical linguistics, mechanical translation, machine-aided language learning, and man-machine communication. It is prepared at the Center for Applied Linguistics by the Language Information Network and Clearinghouse System (LINCS) with the co-operation of institutions in Canada, Czechoslovakia, France, Germany, Israel, Japan and the USA. There will be approximately 350 abstracts from over 75 journals in each issue.

For further information write to *Language and Automation*, Center for Applied Linguistics, 1717 Massachusetts Avenue, NW, Washington, DC, 20036. Subscription is $7 a year for individuals, $10 for institutions.

Encyclopaedia Britannica Microbooks

In March 1971 Encyclopaedia Britannica is to publish in a new microform a 20,000 volume *Microbook Library of American Civilization*. A separate company, Library Resources, Inc. (LRI) of Chicago, has been formed to market the library.

Each microbook contains a maximum of 1,000 positive images, is 77 × 125 mm in size, and is encased in an envelope on which is printed a full-size reproduction of the Library of Congress catalogue card for the work. Several copies of both a complete author/title/subject catalogue and of a topical index and cross-index to the collection are supplied with each library in both book and microfiche form. A table model reader (magnification 90 ×) and a portable reader (magnification 75 ×) are also available.

Further information is obtainable from Library Resources, Inc., 201 East Ohio Street, Chicago, Illinois, USA, 60611. A copy and sample pages of the book catalogues and topical index have been received by the Aslib Information Department.

Automatic indexing: a state-of-the-art report

National Bureau of Standards Monograph 91, *Automatic indexing: a state-of-the-art report*, by Mary Elizabeth Stevens, originally issued in 1965 (see review in the *Journal of Documentation*, vol. 22, no. 3, September 1966, p. 252–3) has been reissued with additions and corrections (February 1970). The additional material consists of a paper updating the field to September 1966 ('Progress and prospects in mechanized indexing' by Mary Elizabeth Stevens) and bibliographic citations, pertinent to the subjects in the original text, up to August 1969.

Orders (prepaid) should be sent to the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151, USA. The cost is $2.25.

Use of the UDC in the production of mechanized indexes

The Zentralstelle fur maschinelle Dokumentation, Frankfurt am Main, have recently issued an English edition of ZMD-A-10, *The use of the UDC in the production of mechanized indexes*, by Klaus Schneider and Karl-Heinz Koch. This is a translation of one of the working papers presented at the Second Seminar on UDC in mechanized information systems, organized by FID/CCC, FID/CR and FID/OM, and held in Frankfurt am Main from 1st to 5th June 1970.

It is available direct from the publishers, Beuth-Vertrieb GmbH, 1000 Berlin 15, Uhlandstrasse 175, price DM 10.50. (See also review in *Program*, October 1970, p. 175–6.)

Northern Branch

A former Honorary Secretary of the Aslib Northern Branch, Miss E. Boddy, is still receiving correspondence, as Secretary, from members of the Branch, which is causing her some inconvenience. Members are asked to note that the Honorary Secretary is now Mr T. A. Silverwood, Information Officer, Ferodo Ltd, Chapel-en-le-Frith, Stockport, Cheshire, SK12 6JP.

BRIEF REVIEWS

EUROLEC UNITED KINGDOM. Electronic components, materials and sub-systems: companies and contacts. Little Waltham (Essex), David Rayner, 1970. 350 p. 35*s*.

This publication forms part of a new series, each covering a major sector of the Electronics industry, which replaces the basic single-volumed GB Eurolec Pocket Guide, the 4th edition of which was published in 1969.

Major differences here are the addition, to the company information, of the year of formation, directors, and related foreign firms plus their offered product ranges. The firms are divided into major product/service areas, and a summary of those firms operating in relatively well defined groups is included. There is also an alphabetical index to the companies together with their telephone numbers.

Sections A–F cover manufacturers and importers of various radio and electronic components including chemicals, materials and metals; Sections GH deal with suppliers, distributors and foreign companies offering products and other services, and section J deals with those firms with a wide range of interests.

MAUNDER, W. F., *ed.* Bibliography of index numbers: an international team project. London, Athlone Press for the International Statistical Institute, 1970. 232 p. 35*s.* (ISBN 0 485 11120 9).

This is a thoroughly revised edition of the bibliography first produced in 1956. The coverage has been extended to include some earlier works as well as those appearing between 1955 and 1967. The most important change, however, is that the listing has been produced by the KWIC method on computer, the main section being a chronological index, with full subject and author indexes following. The list of journals scrutinized bears witness to the international nature of the references. This is a well-presented book with an interesting and useful introduction and prefaces. It should be of great value to economists in particular, but also to anyone interested in index numbers and their sources.

REVIEW OF THE ORIGINS AND DEVELOPMENT OF RESEARCH

1. Tradition, Innovation and Research in the Library

PHILIP M. WHITEMAN

Director
School of Library and Information Studies, Queen's University, Belfast

Paper presented at the 44th Aslib Annual Conference, University of Aberdeen, 20th–23rd September 1970

THE HISTORY of research in library science is not the easiest of subjects to speak on with any hope of presenting significant interpretations and conclusions, because as a topic of interest to the whole profession, in Britain at least, research in our field is a very new one, with the main developments of significance crowded into the last ten or fifteen years—it is as yet far too early to form a historical perspective. True we can review and catalogue a good many facts about research activity, and note certain milestones, but it is not possible, and will not be possible for another decade or two, to assess in a valid way, the significance of all this activity in terms of professional practice.

The fact that most of the significant developments in library science research are quite recent does not mean that librarians in the past have not experimented. In fact, throughout the history of libraries, there has been a great deal of experiment, innovation and ingenuity in the solution of library problems. This is interesting, because one tends to regard *tradition* as a more significant influence. Adherence to tradition is a strong element in our society, and in the make-up of our institutions, including the professions. Whether it is a stronger element in librarianship than in other fields is itself an interesting question. The answer may well be 'Yes', because the need to control collections of books and other material gives rise to the creation of complex devices, such as catalogues and indexes, which once established are very difficult to change without great upheaval and expense. Add to this the idea of *preservation*, *conservation*, *custodianship*, and you have a situation in which it is more comfortable to rely on traditional approaches than to innovate. Incidentally, the importance attached to the custodial function has applied in the great libraries of the world from early times, through the monastic period to the early academic libraries and their red-brick successors, and it is interesting too that major public libraries absorbed a good deal of this tradition on the reference library side. It was of course mainly in special libraries: industrial, governmental, etc. that the traditional emphasis on *preservation* was called in question, and Ranganathan's First Law of Library Science applied. One important element in library *tradition* is the influence of particular personalities—we all know of libraries which are as they are, because for good or ill they were under the influence of a particular chief librarian for a long period. Such domination by an individual may well involve great innovation, if he is by nature an innovator, but the firmness with which he leaves his mark on the institution may well lead to the creation of a new and rigid tradition and thus in its turn to a failure of development in some aspects. During his forty years as Librarian of Congress, Herbert Putnam was responsible for directing the development of many of the services for which the Library is renowed today, but writing of the *management structure* as he found it on his appointment as Putnam's successor in 1939, Archibald MacLeish described the Library of Congress as 'not so much an organization in its own right as the lengthened shadow of a man.'[1]

My reference to tradition is to correct any possible impression from what follows that librarians spend their lives in a long orgy of experiment. Given the background of tradition as a major influence however, it is remarkable just how much librarians have shown a taste for innovation and experiment—not to be confused with research to which I come later. The urge to experiment has resulted mainly from the need to create devices for dealing with administrative problems in libraries. As long ago as the 8th century, Alcuin of York incorporated in a poem the names of numerous authors, and Edward Edwards and others have seen in this a catalogue of the York Library—not a type to catch on perhaps, but a novel idea. Lest you think I am about to embark on a long series of curious early examples of ingenuity in libraries, I will move straight to the end of the 19th Century, only pausing to remind you that in 1627 Gabriel Naudé published his *Avis pour dresser une bibliothèque*—the first textbook of library management—which embraced planning, classification (the relative merits of broad subject arrangement and fixed shelf location by numbers are discussed), and catalogues (both author and classified subject).

The last quarter of the 19th century and the early years of the 20th were a period of intense enthusiasm for new methods, techniques, gadgets. This enthusiam was associated with the exchanges of ideas and information which had been made possible by the establishment of the professional associations, the American Library Association in 1876, the Library Association in 1877. As examination of the early conference proceedings shows, librarians were prepared to listen to vast numbers of papers about each other's methods, intermingled with equally weighty papers of a literary or bibliographical character. Pioneers like Dewey and Cutter were innovators *par excellence*—apart from his classification, Dewey founded the *Library Journal*, the library school at Columbia, and in his enthusiasm for simpler spelling, even fiddled with his own name. A librarian in New England introduced a sloping shelf and shelved his books in reverse order—from bottom to top and from right to left. James Duff Brown's introduction of open access in the lending library at Clerkenwell in 1894 led to a battle with the supporters of closed access and the indicator, the bitterness of which amazes us now. During this period too, the great controversy on the relative merits of classified and dictionary catalogues began. Much attention was given to the perfecting of gadgets for useful purposes. F. J. Burgoyne's fascinating little book *Library construction: architecture, fittings and furniture* published in 1897, contains detailed descriptions, with drawings, of the available devices for adjusting shelves: the Tonks' fitting, the Library Bureau shelf pin, the Chivers adjustable shelf fitting, and so on.[2] I commend

Burgoyne to your attention if you have a mind to know more of Cotgreave indicators, Lambert's magazine frame, the Marlborough book support, Cocker's book-brace, Walker's book rack and slip-sorter, the Heathcote revolving newspaper holder, or the Harvey pneumatic dusting machine. Incidentally, reference to all this gadgetry reminds one that we have no museum of librarianship, despite the Library Association's Royal Charter responsibility in the matter. The nearest thing to it is Wilfred Ashworth's fascinating collection of colour slides on which he bases a talk for which he is now famous, called *Happiness is a smart librarian.*

All of which has nothing to do with *research.* Before making a brief attempt at definition, I would remind you that research activity is characteristic not only of academic situations but also of the fully developed profession. In 1915, the eminent American medical man, Dr Abraham Flexner, advanced six criteria against which the aspirations of an occupational group, to professional status, could be measured. Having emphasized the intellectual content of professional activity he said:

> Professions would fall short of attaining intellectuality if they employed mainly or even largely knowledge and experience that is generally accessible—if they drew, that is, only on the usually available sources of information. They need to resort to the laboratory and the seminar for a constantly fresh supply of facts; and it is the steady stream of ideas, emanating from these sources, which keeps professions from degenerating into mere routine, from losing their intellectual and responsible character.[3]

Defining research in a professional context is not easy. A recent American study of librarianship as a profession by D. E. Shaffer says of professions generally:

> They look upon it [research] as a form of activity which seeks answers to fundamental questions concerning the phenomena of the universe. Research, for the professions, is not concerned with the unimportant and insignificant. Neither is it simply a matter of fact-finding. Its end is the advancement of human understanding, and it accomplishes this through certain accepted methods which experience has proven most likely to produce truthful results.
>
> Some individuals may consider the building of a new piece of library equipment, or the designing of a new system, as being research. Such developments are inventions, not research, even though they may be based on the findings of research. Locating facts is not research but reference work. The formulation of a questionnaire and the tabulation of its answers are not research, although they may be a part of the research process. Research is known, first, by the materials it works upon, second, by the methods it employs, and, third, by the ends it seeks. It is governed by the principle of objectivity and rejects all authority except that of valid evidence.[4]

He goes on:

> The need for research in any field is quite obvious. Research produces knowledge which is needed for understanding, and understanding coupled with skill leads to effective action. In the library, as in every other field of endeavor, innumerable intangibles appear that cannot be reduced to objective, quantitative, and predictive terms. However, they can be rationally observed, described, classified, and evaluated. Some aspects of librarianship have already been put on a scientific basis. The job of librarians now is to extend it to every other phase of librarianship that is amenable to scientific investigation.[5]

Finally, Shaffer warns against the misuse of the term 'research':

> For example, counting the number of books circulated, finding out whether or not the patron actually read the material borrowed, and determining the percentage of the population using

> the library are activities not fitting the scientist's definition of research They are fact-finding activities but scientific methods are not required and the results do not answer fundamental questions. Neither do such activities lead to the definition of general principles. It must be admitted, therefore, that some of what passes for 'library research' is not research at all.[6]

I recall similar discussion in the Research and Development Committee of the Library Association of the distinction between *research* and *development work* some time ago. The papers by Mallaber and Lewis referred to later, consider this question in some detail.

Until research and development in our field began to come into its own in Britain only a few years ago, we tended to think of library research very much in an American context. This was due, to a large extent, to the work done in the American library schools. Dewey, of course, when founding the first school at Columbia in 1887, thought of it as offering practical *training* more effectively than did the usual apprentice-type arrangements—he certainly was not imbued with ideas of broad professional education, still less with notions of research. Indeed it was not until the establishment of the Graduate Library School in the University of Chicago in 1928, with a million dollar grant from the Carnegie Corporation, that advanced study and research in librarianship became a reality. In 1932, Louis Round Wilson became Dean of the Chicago School, and gathered round him a remarkable team of specialist teachers whose writings have a permanent place in the literature: Pierce Butler (*Introduction to Library Science*, 1933); Douglas Waples (*People and Print*, 1937, and other sociological studies of reading and library use); Carleton B. Joeckel (*The government of the American public library*, 1935); William Randall (*Principles of college library administration*, 1936), Leon Carnovsky and James Westfall Thompson. Also of vital importance was the founding of *The Library Quarterly* in 1930—from the first it had close connections with the Chicago Graduate School and became the principal vehicle for the publication of major papers on the theory and practice of librarianship, including accounts of a wide range of research activity.

The Chicago Graduate School was for many years the only American school which offered a Ph.D. programme centred on research seminars and a dissertation, in addition to the Master's degree programme offered as a *second* postgraduate year's work in library science by several other schools: California, Columbia, Illinois, Michigan. Subsequently under the 1951 standards of the ALA, a number of schools developed Ph.D. programmes, the Master's course, with and without some kind of modest thesis requirement, becoming the normal postgraduate one year programme in library science. Doubtful eyes have often been cast on the American concept of the Ph.D. dissertation, and it is not difficult to pick out from the enormous lists of dissertations in library science, examples which on the face of it seem inadequate as to content for such high academic honours, and trivial if viewed from the angle of usefulness to the practising profession. Such titles are: *The influence of antecedent library service upon academic achievement of University of Illinois freshmen*; *Local efforts to prepare library assistants and librarians in Texas from 1900 to 1952*; *Factors affecting the choice of school librarianship as a profession*, and they do raise doubts in ones mind. (The doubts are even greater with some of the Master's theses, which are of course, no longer a feature of most library schools' Master's programmes.)

There is a difficulty here however, namely one of conflict between the legitimate desire of the research student to pursue studies along lines of his own choosing, and the equally legitimate desire of the profession for a flow of valid information relevant to its problems. It has to be accepted I think that there are strict limits to the practical value of the research undertaken on an individual basis and directed at high academic honours. This is not to minimize its value, for it provides the candidate with essential experience in carrying out research, and adds something to the store of knowledge, and is thus contributory to the future development of the subject—in this sense library science is in much the same position as other areas of knowledge and activity.

The American experience seems to show (as our own more recent one does for the most part) that *money* is of the essence where major research activity is concerned and that in the main, money is only made available on a sufficiently generous scale, where major projects under institutional auspices are involved. (There are, of course, US government Fellowships under Title II of the Higher Education Act of 1965, to support Doctoral students in library schools.) Major examples of funded projects in recent years are the Social Science Research Council's Public Library Inquiry of 1950 paid for by the Carnegie Corporation of New York ($200,000), the Knapp School Libraries Project of the ALA in the 1960s funded by the Knapp Foundation, Inc. ($1,130,000), and the various projects supported by the Council on Library Resources. The Council was established in 1956 at the instance of the Ford Foundation with a grant of $5,000,000 to be spent over five years 'for the purpose of aiding in the solution of problems of libraries generally and of research libraries in particular, conducting research in, developing and demonstrating new techniques and methods, and disseminating through any means the results thereof, and for making grants to other institutions and persons for such purposes; and for providing leadership in and wherever appropriate, co-ordination of efforts (1) to develop the resources and services of libraries and (2) to improve relations between American and foreign libraries and archives.[7] In 1960 and in 1967, the Ford Foundation approved further grants totalling $13,000,000. Recent reports of the Council record support of: Project MARC; co-operative automation of services in the National Library of Medicine, National Agricultural Library and the Library of Congress; Project INTREX; the development of a classification scheme for slides; a time and cost analysis of certain library operations; development of library theft-detection devices; and many others. One of the Council's most important continuing activities has been support, throughout the eleven years of its existence, of the ALA's Library Technology Program, which tests and evaluates library equipment, supplies and systems, promotes the development of new and improved library equipment and provides an information service on these matters through the bi-monthly subscription service *Library Technology Reports.*

* * * *

I turn now to research and development work in British librarianship. Most of the significant developments are post-World War II. I shall be saying something later about present arrangements for the award of the Fellowship of the

Library Association, and this reminds me of the pre-war situation. During the 1930s, Fellowship was awarded to those who had passed the old Final Examination but it was possible for a Fellow to gain the Honours Diploma by submission of 'a satisfactory Thesis showing research on some approved subject within the purview of the Syllabus'.[8] This was no walkover, and a number of significant pieces of work were done, certain of them seeing the light of day as books: notably R. C. Barrington Partridge's *History of the legal deposit of books* and Dorothy Norris's *History of Cataloguing.* Unfortunately, when the new post-war LA Syllabus was introduced in 1946, the Honours Diploma as such disappeared, mainly I believe because of the administrative problems involved in examining the theses. The thesis became an 'essay' forming *part of the Final Examination.* The essay was to be of '5,000 to 10,000 words' and it was not 'necessarily . . . expected to cover new ground, but should show original treatment and research and first-hand study of the subject selected'.[9] This was clearly a downgrading of the research element in the Association's structure of examinations and qualifications, and hardly surprisingly, it gave rise to some rather second-rate productions. Equally predictably, it was dropped altogether in the revision of 1950. The dropping of the Honours Diploma thesis and then the essay left a gap which was filled to only a slight degree by the School of Librarianship and Archives, University College London, which required a bibliography or thesis from candidates for Part II of the Diploma in Librarianship. Instructive as these exercises were to the candidates concerned, they added little to the body of professional knowledge, for the vast majority of submissions were bibliographies.

We have now become used to the idea of organized interest in research and development through national agencies: OSTI, Aslib, the LA, and so on, but in fact this interest has been building up over a period of years through an impressive range of apparently unrelated events and projects. I would like to refer briefly to some of these, which I consider significant:

1. The founding of the *Journal of Documentation* in 1945, which provided for the first time, a satisfactory vehicle for publication of original thought and research in the field of special library and information techniques.

2. The founding of *Library Science Abstracts* in 1950 which provided the necessary complement to *Library Literature* as a record of professional literature. *Library Science Abstracts* has now been replaced by *Library and Information Science Abstracts*, a change involving significant co-operation between the LA and Aslib.

3. The development of the Classification Research Group over the last fifteen years or so. This informal group which has probably gained from not being an appendage of either major library association, has done much fundamental work in its field, notably by undertaking the Nato supported LA project on a pilot scheme for a general faceted classification. It has also produced, and is responsible for, the *Classification of Library Science*, which is being used to arrange *Library and Information Science Abstracts.*

4. The Aslib Cranfield Research Project, begun in 1957, with a substantial grant from the National Science Foundation, Washington. I need only remind you of it—Mr Cleverdon will say more—but note that this major project and

the CRG work on a general faceted classification both involved substantial funding from outside, a point I shall come to later.

5. The Library Association survey of book charging systems, carried out by Hogg, Matthews, and Verity, in 1959 to 1961, with a small grant from the Association. I regard this as significant, not only for the very useful conclusions which were reached, but because it made librarians aware of the value of work study techniques in libraries (the survey was of course carried out by one librarian and two work study specialists) and helped to prepare librarians for an intelligent approach to those management surveys, O & M surveys, and so on, which were to be imposed on them when individual local authorities took to establishing their permanent teams of O & M experts or engaged firms of management consultants. The vast majority of these management survey reports in the local government field remain unpublished in anything like their full form, which is regrettable because their significance as research and development literature is great. This coyness made all the more welcome the publication, in 1968, of the full report on the survey of Hertfordshire County Library.[10]

6. The work done at the National Lending Library for Science and Technology, both as regards the organization and administration of the NLL itself and the investigations carried out on such matters as the patterns of use of scientific serials. Both have been a great stimulus to professional thought and have jolted the profession out of many of its long cherished assumptions and attitudes.

7. The awakening of interest in the scientific examination of management problems in the academic library field. In this connection I would remind you of the several reports of investigations using operational research techniques at the University of Lancaster, which have appeared since 1968, and the Final Report of the University of Durham's PEBUL (Project for Evaluating the Benefits from University Libraries), published in 1969. Both projects were supported by OSTI. The Dainton Committee stressed the need 'to improve the effectiveness of the existing services of the national libraries and to evolve new services' and suggested that 'the following types of research . . . should be undertaken: (i) the collection of statistical data; (ii) operational research; (iii) research related to forward planning; (iv) research concerning new applications of computers; (v) research and development on library technology'.[11] It further recommended that the proposed National Libraries Authority should establish appropriate research facilities of its own, and that it should be empowered to sponsor research in other libraries, and 'to carry out or fund research projects of wide application to other library and information activities, so long as the research has some relevance to the efficient operation and potential development of the national library services'—taking over many of the responsibilities of OSTI in the process.[12]

I turn now to the work of the two associations, the Library Association and Aslib. K. A. Mallaber has pointed out in his paper *Research in Librarianship*,[13] that the establishment of the LA Library Research Committee, as it was originally called, was really a device for governing various technical committees, notably the Cataloguing Rules Committee, rather than a conscious move towards research and development as we think of it today, and that much of its business had nothing to do with research. Mallaber pointed out that a change of emphasis became apparent in 1960, when at D. J. Foskett's suggestion, the LA Council decided to support research projects, an important breakthrough because as Mallaber put it 'a research committee with even a little money is in a vastly different position from a research committee with no money.[14] Mallaber indicated some eight projects for which the LA had recently been or was currently responsible: the book charging survey, the *Guide to current British periodicals*; the Research Institute for Consumer Affairs' survey *The Londoner and his Library*, partly financed by the LA; the pilot scheme for a general faceted classification, with a grant of £5,000 from NATO; the work on the needs of partially-sighted readers, with a grant of £10,000 from the Nuffield Foundation; a survey of classification practice and opinion in Britain, with a grant of £1,050 from the United States; the support of research assistantships at the North Western Polytechnic; the work of the Cataloguing Rules Committee. Mallaber saw as one of the biggest problems, that of *money* to support the various small projects, and those major projects which if undertaken, could provide valuable information for the profession. A British equivalent of the Council on Library Resources being a somewhat unlikely development, Mallaber concluded that the only likely source of funds on the scale required, was the central government.

What of Aslib? The Aslib Research Committee was set up in 1957 and the annual report of that year included a list of desirable research projects, notice of intent to set up a research unit, and a record of the grant of £10,000 received in that year for the Cranfield project.[15] Annual reports of subsequent years record the setting up of the Research Department and work on a wide variety of research projects in the information field—these are too well known to members of Aslib for it to be necessary to cite them. Of course, Aslib has had the enormous advantage over the years—and this comes back to Mallaber's point—of substantial and regular grants from central government sources, first from the old DSIR and subsequently from OSTI—currently with some two-thirds of it being earmarked for research. In 1969, the OSTI grant to Aslib for research was over £35,000, and that for general purposes, nearly £17,000, while the Research Department has a professional staff of seventeen.[16]

Expression of the need for central government support of library and information research by Mallaber, was followed by the establishment of the Office for Scientific and Technical Information within the Department of Education and Science, in 1965. It is true that its main functions lie in the areas of scientific and technical information over the whole field of the natural and social sciences and their related technologies, and that its terms of reference have been quite broadly interpreted, but there is a case for its embracing the *whole* field of librarianship in all its aspects, to correspond with the now very wide responsibilities of the Secretary of State for Education and Science in these fields. Certainly, OSTI operates within a narrower field than does the Council on Library Resources. (Victorian periodical literature, children's literature, medieval manuscripts on microfilm, the development of library services in new towns and the home delivery of books (not just for the housebound), are all subjects studied with CLR support). The considerable scope of OSTI activity is best judged by reference to the sixteen or so issues of *OSTI Newsletter*. One of the areas in which OSTI seems likely to be taking increasing interest is that of the management problems of libraries—it is already supporting the Library Management Research Unit at Cambridge University, and a statement of future policy on management problems in libraries and information systems has recently appeared.[17]

I return now to the LA and Aslib, and to the organization of research in the two associations. P. R. Lewis, in his highly influential paper *Research performance in Librarianship*,[18] continued the discussion which had been begun by Mallaber. He drew attention to the considerable annual grants received by Aslib from OSTI, and compared this position with the Library Association's *total* receipts from OSTI of £4,200. Lewis went on to argue for greater participation by the LA in research activities and saw as the main problem the arrangements in the Association for the administration of research matters. In particular he saw the Research Committee as 'constitutionally ill-adapted to organize and exploit the manpower resources available for research within the profession' (it was a typical committee of the LA Council with its members drawn from the Council, rather than from groups and individuals with a special knowledge of research) and he considered the Research Officer and his small staff to 'have so many duties unconnected with research proper that they cannot give sufficient time to research activities'.[19] He proposed the substitution of a Research Department with a full-time Director of Research and a staff of research people, the main difference between such a set-up and that of Aslib being that 'the LA Research Department would not be so much concerned with carrying out work itself . . ., as in harnessing the activities of the available research strength within the Association . . .,[20] and he went on to refer to participation by the groups and sections of the LA and the library schools in such a programme. The influence of Lewis's paper was considerable. It galvanized the Research Committee into serious thought about its constitution and function. The Committee changed its name to Research and Development Committee, and early in 1969 established two new sub-committees, the first a Grants and Awards Sub-Committee to administer the award of research grants from LA funds, the second an Advisory Board on Research, composed mainly of persons with research experience rather than members of the R and D Committee as such, to advise the R and D Committee on the research policy of the Association—what research is needed, what research the Association should carry out, what other machinery exists and could be used for research purposes, what methods could be used to adequately disseminate the results of research. The new Advisory Board initiated the idea of a two-day Seminar on Library Research Methods, organized in collaboration with Aslib in December, 1969.

This seems a good point at which to refer to LA/Aslib co-operation in the research field. As long ago as October 1958 the minutes of the LA Library Research Committee recorded that 'Aslib had signified its willingness to collaborate with the Library Association in a regular exchange of information about the nature of research projects being undertaken by the two bodies.' For several years the research officers of the two associations have sat as observers on each other's committees. As regards the larger question of closer liaison, or amalgamation, between the two associations, discussions began in 1967 and continued in 1968, by which year it was apparent that outright amalgamation was out of the question. As regards division of function, discussion centred on the idea that Aslib would become the research association for librarianship, while the LA took responsibility for individual workers in library and information service, and for an enlarged information service in the field.[21] The associations eventually agreed that such division would be unacceptable to their members, and that there should be continued co-operation. That seems about as far as we are likely to get, although discussions on closer relationships were revived in 1969 and, as far as I know, continue!

I turn now to the Fellowship of the Library Association and to the position of the library schools in the research field. The Fellowship has long been and is the highest qualification which the LA awards. With the introduction of the 1964 syllabus of professional examinations, it was determined that the Fellowship would henceforth be awarded for original work (the disappearance of the old Honours Diploma of pre-war days had been much lamented) and a Board of Advanced Studies was set up to administer the new arrangements. These have now been operating for several years, and the one major disappointment concerning the theses proposed and submitted has been the preference of candidates for the compilation of bibliographies over investigations of library problems. The Board of Advanced Studies has become much more stringent in its requirements where bibliographies are concerned, and the latest lists of thesis subjects approved and of theses accepted, together show the numbers of bibliographical compilations and of other projects to be more or less in balance.[22]

Over the years since the mid-1950s librarians have bewailed the small amount of research being carried out in library schools. Mallaber in 1965 referred to this and rightly pointed out that 'as long as even senior lecturers are teaching 20 hours a week and spending the rest of their time in administration, there is no hope of them carrying out any research'.[23] In 1968, Lewis noted the increased staff of schools, including 'half a generation of middle senior librarians . . . recruited into library schools by vocational pressures and the blandishment of Heads of Library Schools. Many of them have enough time free from teaching duties to be available for research. . . .'[24] In 1969, the LA Education Committee asked me to collect information on research, consultancy work, etc. being undertaken in the library schools. A summary of the findings appeared in the *Library Association Record* in February, 1970.[25] The survey was in no way evaluative but it did serve to reveal far more activity than had been supposed to exist, with significant funding of projects at four schools, and a very wide range of subject matter under investigation. The other point of interest about the library schools in the context of research is that it is now possible for a suitably qualified graduate, or in appropriate cases, a non-graduate Fellow of the Library Association, to undertake research leading to a higher degree in library and information studies at one of the universities: M.Phil. or Ph.D. at London; M.A. or Ph.D. at Belfast; M.A., M.Sc., or Ph.D. at Sheffield; M.A. or M.Sc. at Strathclyde; M.Phil. or Ph.D. at the City University, and so on.

These facilities are giving rise to a variety of useful work: subjects for which M.A. students (all of them experienced practising librarians) are registered at Belfast include: *Periodicals as sources of information in architecture*; *The history and development of special libraries and information services in the Liverpool area*; *Control in index languages and techniques of performance measurement in indexing*; *Analytical indexing of topographical information contained in maps, deeds and other documents*; *Problems of selection of literature in science and technology*; *UDC: the history, current status and potential development of a large general classification scheme*; *The development of management documentation services in Britain and Ireland.*

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Finally, I would like to refer briefly to the problem of availability of information about research in progress—I became more than usually aware of this difficulty when conducting the modest survey of library school research activity. A few years ago there was some hope of a current information service on work in progress with the publication of *Library research in progress*, by the Library Services Branch of the US Office of Education, but that died the death. (That the need is still felt in the States is apparent from a recent letter and questionnaire sent out on a world-wide basis by Dean Paul Wasserman of the School of Library and Information Services, University of Maryland—a comprehensive published register and a frequently issued periodical publication are proposed.) In Britain there are several useful but unco-ordinated sources: the *LA Year Book* with its feature 'Research in Progress'; the *LA Library and Information Bulletin*, now published only occasionally, which lists with abstracts, accepted Fellowship and higher degree theses, and records LA research activity; and Edward Reid-Smith's little periodical *Research in Librarianship* with its feature 'News of research projects' and some abstracts of FLA and higher degree theses.

I said at the beginning that the likelihood of significant conclusions emanating from a general and historical paper on this subject were slight. Having heard my own words, I am confirmed in this impression, but I hope that this review will have helped to set the scene for the real meat of the conference—the specialized papers which follow.

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REVIEW OF THE ORIGINS AND DEVELOPMENT OF RESEARCH

2. Information and its Retrieval

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MY TASK in this second introductory paper is to attempt a review of the research that has been undertaken in relation to the retrieval of information. It is some twenty years ago that the term 'information retrieval' was first used, reputedly by Calvin Mooers, although it was several years later before it became a generally accepted term. It would be absurd to suggest that there was no such thing as information retrieval before the term was coined, but it is useful to consider it as marking a new approach to a problem that had always existed, but which had become very much more serious in consequence of the great increase in scientific and technical literature during and after World War II.

Many hundreds, if not thousands, of research workers have made their contributions to the development of the subject, and it is bound to be a somewhat invidious and arbitrary task for me to try to pick out the few whose work I shall mention. Any other approach, however, could result in a list of references which was longer than the paper, and I shall therefore attempt to consider those projects which in retrospect appear to be important, not only for the immediate results, but for the influence which they had on subsequent work, and at the same time relate these individual approaches to the various trends and fashions in the subject.

One of the original incentives to development was the availability of relatively new physical forms of the index. At its Annual Conference in 1947, Aslib brought together in one session three people who had already been active in the use of punched cards, namely Dr M. Dyson, Dr W. E. Batten and Dr J. W. Perry.[1] Reading these papers and the subsequent discussion one can, with hindsight, note the confusion that was arising with the advent of mechanized sorting, the confusion regarding the methods and the means, which in many ways has persisted to the present day in spite of what Robert Fairthorne has said and done. Fairthorne, whom I place as the major intellectual contributor in the field, was the Honorary Secretary of the British Society for International Bibliography at the time when, in 1948, it merged with the Association of Special Libraries to form the present ASLIB, but it was a year earlier that he made his first significant contribution to the subject when in one session he presented two papers, 'The classification of mathematics' and the more important contribution 'The mathematics of classification'. Over the next decade, Fairthorne was responsible for a succession of masterly papers in which he considered and suggested possible solutions to problems of which few other people were aware. It was, however, his ability to express these problems in mathematical terms which was so decisive in bringing into the field many mathematicians and scientists. In the introduction to Fairthorne's collected papers,[2] Mooers wrote 'these papers provide more in the way of maps for future research than monuments to what is past'. That sentence, written in 1961, still remains largely true now in 1970.

While Fairthorne with his theoretical papers was to have a major and continuing long-term influence on research workers, his immediate impact on actual operational systems was small as compared, for instance, to that exerted by Dr Mortimer Taube. Taube was a professional librarian who was one of the first to believe that he could sell his ideas and services in the open market, and in 1952 he formed his company Documentation Inc. For the early part of its existence this company largely depended for its success on the exploitation of the brain-child of Dr Taube, the Uniterm system of co-ordinate indexing. Co-ordinate indexing was not a new concept, but combined with the commercial exploitation of the technique, the new element was the emphasis on what virtually amounted to an uncontrolled vocabulary. It is difficult now to convey to relative newcomers in the field the tense and bitter argument, the absolute rage, which this system provoked. Regrettable as this may have seemed at the time, it was this public argument which was largely responsible for shaking at least one section of the library world out of its lethargy and bringing it face to face with the new problems which were arising.

I have mentioned that Dr Taube formed his own company, and in retrospect we can see how fortunate it was that he had sufficient faith in his own abilities to take this step. Had he tried to project the new concept of Uniterm indexing from the secure basis of a government library, it would have had little chance of getting the intensive research and development which it received from the staff of Documentation Inc. The five volumes, *Studies of Coordinate Indexing*, issued in the period 1953–57, contain many papers that are still of interest and value.[3] Most of these papers were based on research undertaken for US Government Agencies, and I would interpolate here a comment concerning the important role of these agencies in the funding of research in information retrieval. [illegible] many new people were able to participate in documentation research [illegible] organizations as the US Navy *ment in Scientific Documentation* with 10 projects dealing with information storage and retrieval. By 1960 there were 44 projects listed; the final issue of the publication in 1966 included some 288 projects.

From this mass of activity, what is there that can be selected as significant? Undoubtedly the work of Peter Luhn of IBM, who in 1957 was proposing that automatic text analysis, using a computer, would provide the answer to what Fairthorne had earlier called the 'greatest bottleneck', namely indexing.[4] The purpose of indexing is to reduce the amount of material to be searched; the traditional method for doing this is by the intellectual assignment of some kind of index terms, whether they be descriptors, subject headings or classification numbers. However, if two indexers, expert though they may be, assign labels to a given document, it is well known that there will be a substantial area of disagreement; normally less than half the total set of index terms will be common to both lists. It can therefore reasonably be argued, and in fact demonstrated, that there is no such thing as perfect indexing, and automatic indexing only needed to reach an equivalent level of quality in order to be considered satisfactory, from the viewpoint of performance. Economic factors, of course, were not considered in these early projects.

The simplest process was to rely on word frequency as a means of identifying the content of a single document and thereby the terms to be used for indexing. Some arbitrary level of exhaustivity would be decided so that the *n* most frequent significant words would be the index terms. From this simple technique a whole range of strategies was proposed for automatic indexing. Luhn suggested that the pattern of appearance of a particular term should be taken into account, for example the occurrence of a term twice in the same paragraph or in succeeding paragraphs would increase the importance of the term. Edmundson[5] was the first to propose that the relative frequency of a term should be the deciding factor; the frequency of each term in a document collection would first be established and those terms which in a given document occurred more frequently than would be expected were considered significant. Another sub-area, investigated by Maron,[6] involved the automatic assignment of indexing tags to documents, where the computer scanned the complete text of the document and on the basis of its vocabulary, assigned it to a particular category in the existing classification or list of subject headings. A complex development was the [illegible] index. By using a 'stop list', the computer ignores all syntactical words such as articles and prepositions, and other words, such as 'Report' or 'Introduction', which are considered to be meaningless within the context of the collection, and selects the remaining words in the titles as indexing terms. These are then manipulated so that each term is listed in alphabetical order and in the context of the other words in the title. Although Luhn was mainly responsible for the popularization of this form of printed index, it appears that, using punched card equipment, the basic idea originated in 1953 and was applied at the Central Intelligence Agency.[7]

Before returning to more doubtful areas of activity, I might mention two other situations where the computer has been shown to have a significant role in the development of information retrieval services. In 1955 Dr E. Garfield had started his initial efforts to produce a citation index in the field of science and technology. The technique was not new, for it had long been widely used in the legal profession. It was not, in fact, even new in science, for the Institution of Electrical Engineers produced a citation index for Physics Abstracts from as early as 1898 until 1922. Its discontinuance appears to have been due not to any doubts concerning the value of the index, but to the practical problems presented by the increasing number of papers, this being combined with a growth in the habit of citation. The important contribution of Garfield was to realize that the computer was a tool which could be used to overcome the practical difficulties, thereby making possible the massive and valuable citation indexes of today.

A second successful application of computers has been in the area of published indexes. In 1960 the National Library of Medicine was faced with an ever-increasing problem in producing the *Current list of medical literature* on a reasonable time-scale. The answer lay in the mechanization of the clerical process of sorting and arranging the tens of thousands of entries which made up each issue, and the hundreds of thousands of entries in the annual cumulations. By 1964 MEDLARS was in operation and Index Medicus was produced by the GRACE high-speed phototype-setter in a fraction of the time taken by the old clerical methods. Although in this case the use of the computer did not result in a new or different product, the pioneering work of the National Library of Medicine ensured the continuing economic viability of the printed index which is still, and is likely to remain for some time, the most widely used retrieval tool.

Classification, under one guise or another is always with us. There was an indication that it might have been rejected and out-moded when Dr Taube introduced the Uniterm System twenty years ago, but it crept in again under the cover of the new alphabetical list of descriptors—which is of course, to all intents, the alphabetical subject headings of old—and which, when published with accompanying sets of related terms, is known as a thesaurus. It would be very difficult, however, to find anything that could really be called research in the development of the thesaurus as a form of index language, although in some cases one can detect the influence of the work of the Classification Research Group, which has steadily developed the concept of facet classification over the past twenty years and many of whose members are recognized as leading authorities.

I would hesitate to attempt to interpret the views of the Classification Research Group, but it can I think fairly be said that, together with most makers and users of thesauri, classification schemes etc., the Group has had two firmly held beliefs; first that an index language must have a controlled list of authorized indexing terms and secondly that it should have a formal set of established relationships between the terms. Operating exceptions to either of these viewpoints have been rare; when asked what was the authority list for the Uniterm system, Taube is reputed to have replied that it was Webster's Dictionary, although in later years he accepted that a modicum of control was desirable. TeNuyl, an engineer in charge of a patents information service in The Hague, was also prepared to accept as an index term any work that appeared in a document, although his l'Unité system, as it was called, is mainly remembered for its ingenious coding method.[8]

These generally shared beliefs have kept the members of the Classification Research Group occupied at their monthly meetings for the past twenty years in discussing the theoretical and practical basis for the optimum arrangement and order of terms, at first in special classifications and more recently in a general classification. Elsewhere many other groups of people, such as the Engineers Joint Council in New York, have spent many long hours in devising ever new sets of terms and relations. The committees of the International Federation for Documentation who are responsible for the Universal Decimal Classification have proliferated and struggled long to reach a compromise acceptable to both East and West on the exact arrangement of the sub-divisions for air-cushion vehicles, while others, determined to drag the UDC into the seventies, have investigated its suitability for a computerized system.

More particularly, the belief that classification was an essential ingredient of an index language was responsible for a considerable number of investigations into the possibility of using a computer to prepare such a classification. Starting in 1959, this activity culminated in a major meeting in 1965, a symposium on 'Statistical association methods for mechanized documentation'.[9] These mechanized methods for deriving association relied on the calculation of the measure of relationship between words, on the basis that words which are found in similar environments will be synonymous. One of the earliest workers in the field, Doyle,[10] suggested that, to use his terminology, he was preparing 'semantic road-maps for literature searches'. Stored in the computer memory, the machine could be instructed to enlarge the initial statement of search request by retrieving documents tagged with related terms. Unfortunately, of all the investigations working towards similar objectives, in no cases have any of the techniques been shown to be of practical use.

For myself I would not presume to comment on the mathematics involved, but to quote Senko on this point: 'The problem is almost certainly not with mathematics, although proponents continue to suggest that only better measures or larger data bases are required.'[11] The difficulty lies, rather, in the fact that neither of the two basic assumptions, namely the importance of a controlled list of indexing terms or the availability of a set of relationships, has been shown to be correct. There are certainly situations in which one or other aspect is desirable as, for instance, in a printed index or in the physical arrangement of books on shelves, but in the context of mechanized information retrieval systems, most of the experimental evidence that is available indicates that both assumptions are false.

I have mentioned the word 'experimental' which has not previously been used in this paper, and this introduces a set of projects which can be considered as having had some effect on the development of information retrieval systems. It was in 1953 that Documentation Inc. (DI) was involved in a test to compare the performance of the new Uniterm System of Co-ordinate Indexing with the conventional catalogue using subject-headings as prepared by the Armed Services Technical Information Agency (ASTIA). For the test fifteen thousand documents, indexed by DI with an average of eight uniterms per document, were used. Ninety-eight requests for information, as received by ASTIA from their users, were searched in the Uniterm index and also in the ASTIA subject-heading catalogue. Each group then analysed the output which had been obtained as a result of these searches and made their decisions as to which documents would be relevant to each question. When the two groups met to consider the results, there occurred the first clash on the thorny problem of relevance decisions, an aspect of testing which was to generate so much argument for many years. Because of the serious disagreements which arose between the two groups, no formal overall report of the test was issued, and it was not until 1956 that a brief account became publicly available.[12] From this paper it can be gathered that DI and ASTIA retrieved a common set of 580 documents which were accepted as relevant. In addition DI retrieved a further 492 documents which ASTIA conceded were relevant, while ASTIA retrieved 319 documents which DI accepted as relevant. Finally ASTIA retrieved 1,089 documents and DI retrieved 488 documents which the other group was not prepared to accept as relevant. Translated into the usual measures this indicates a recall ratio of 77 per cent for DI and 64 per cent for ASTIA, with a precision ratio of 68 per cent for DI and only 43 per cent for ASTIA. There were so many uncontrolled variables that one should hesitate to read too much into these comparative figures, but they were sufficiently striking to raise serious doubts on some widely-held beliefs.

Unfortunately the results of the ASTIA-DI tests were virtually ignored as was the case with what we can now see was an equally, if not more important test, reported by Swanson in 1960.[13] This was the first time that there had been a direct comparison—albeit in an artificial environment—of a conventional manually indexed system in comparison with an automatic text processing system. The document collection consisted of a hundred short articles in the field of nuclear physics and fifty questions were used. A group of scientists assessed the relevance of each document against each question and on the basis of these relevance judgements the performance of the system was compared using a measure similar to recall/precision. The results indicated that the average retrieval performance of the system based on automatic text analysis was superior to the performance of a standard system based on manual indexing and it is worth quoting from Swanson's report:

> The first conspicuous implication of the result is that the proportion of relevant information retrieved under any circumstances is rather low.

> The second implication of the data is the apparent superiority of machine-retrieval techniques over conventional retrieval within the framework of our model.

Subsequently Swanson extended his test, using natural language queries in place of the manually constructed search formulations of his earlier test. In this later project, documents were retrieved in decreasing order of expected relevance, based on the match between queries and documents, and a new measure was used for computing the results. However, it again appeared that automatic text processing was superior and on this occasion Swanson made the comment:[14]

> . . . though these results may violate one's sense of intuition, there is no good theoretical reason to believe that they ought to have come out differently.

In contrast to Swanson's work, the report of Cranfield I[15] received wide publicity. In this test an attempt was made to compare four different index languages, using a special collection of 18,000 documents and 1,200 questions. The results showed that there was little significant difference between the results obtained for any of the four index languages. Most interesting was that it appeared that virtually uncontrolled uniterms were as effective as the closely controlled subject headings and the lack of built-in relationships had not affected the performance of the Uniterm system or alphabetical subject catalogue in comparison with the structured classification system such as the Universal Decimal Classification, and the special faceted scheme. This first Cranfield test did not really answer any of the problems of IR systems, but it was particularly effective in showing where the real problems lay, and Cranfield II was a logical continuation.

It had been shown that there was a clear and complete distinction between the decision of the indexer in regard to the concepts that should be recognized in a document and the index language that can be used, this is the list of indexing terms for expressing those concepts and the rules which have to be applied in operating the system. Since all indexing starts with the perusal of a document, the words as used by the authors must be the basis of any index language. From this stage there are a limited number of devices which can be used and which have one of two objectives. On the one hand there are those devices which will increase the total number of documents retrieved, while alternatively there are those devices which restrict the number of documents retrieved. In the former case, recall will be improved, and in the latter case it is precision. We know that improvement in one of these measures can only be at the expense of the other so all that can be hoped for is to obtain the optimum solution. In any operational index language, these devices are combined in different ways; the Universal Decimal Classification, for example, uses co-ordination, links and roles, and also can have a modified term of weighting. These are, of course precision devices; its recall devices include the normalization of words, a controlled vocabulary and a hierarchical structure which gives varying levels of specificity. It is equally possible to include these devices in a conventional alphabetical subject catalogue, and in Cranfield I it was impossible to discover what effect each or any of these devices had on the performance of a given system. The major purpose of Cranfield II was to investigate all possible devices in isolation and in combination. The results indicated that co-ordination was the only precision device which significantly affected performance, and most surprisingly, that the single term index languages were more efficient than any of the controlled languages.[16] This was a conclusion that might have been surmised from the first evaluation by Taube, or possibly from Cranfield I, but it should certainly have been apparent from the work by Swanson since we can now see that the superior results in this project were due not only to the automatic text analysis procedure, but also the fact that he was working with natural language.

Before considering the implications of this experimental work, I would like to refer to four other important research projects. In point of time, the earliest of these was that which commenced at Cambridge Language Research Unit in 1956, originally in the field of mechanical translation. The analogy between mechanical translation and information retrieval was recognized and was discussed in a paper presented at the International Conference on Scientific Information in Washington in 1958.[17] One of the joint authors of that paper, Dr Karen Sparck Jones has continued the work since that time, latterly at the University Mathematical Laboratory, Cambridge. The project has been largely concerned with the automatic generation of association between terms, an activity which I suggested earlier in this paper had been largely unprofitable, and it therefore may seem illogical that I should stress the importance of this project. The reason is that the work has recently moved into a new phase[18] and Dr Sparck Jones, using various collections of documents and search questions, has carried out an intensive series of experimental tests, going far more deeply into the subject than has previously been possible. Already she has been able to increase our understanding of IR systems by demonstrating the very close relationship that exists between, on the one hand, the exhaustivity of indexing and of the search programme, and, on the other hand, the precision of the index language. It is by no means certain that the problems posed by the inverse relationship of recall and precision will ever be solved, but in the work now being done at Cambridge there is, I believe, the possibility of significant improvements in one important area.

The second project I mention is that of Professor Salton. The SMART system originated in 1960 at Harvard University and transferred with Professor Salton to Cornell in 1967.[19] SMART is an automatic text processing system which can manipulate documents and search requests, both of which are expressed in natural language, and which produces ranked lists of documents that appear to match most closely the search request. A major strength of the system has been that a large number of different control analysis procedures are available to generate identifiers for documents and requests. Over the years many methods have been tried, and on the basis of rigorous test results, some have been rejected and others selected for further development. Using collections of documents in a number of different subject areas. Salton has been ble to show that by searching on abstracts in natural language, it is possible obtain at least parity of performance as compared to indexing. While the nomics of SMART are such that it cannot at present be contemplated, I e little doubt that the work of Salton will be applied in operational systems hin a few years.

The third project I wish briefly to mention is that directed by Professor T. Allen at Alfred P. Sloan School of Management at Massachusetts Institute of Technology[20], while the fourth is that directed by Dr W. E. Garvey at the Center for Research in Scientific Communication at Johns Hopkins University.[21] It may seem that I am straying from my brief in mentioning research projects that are concerned with the transfer of information on a wider scale, for Professor Allen is investigating where and how people locate information, while Dr Garvey is specializing in the effectiveness of scientific and technical conferences. My reason for including them is that we cannot intelligently design information retrieval systems without knowing the habits and requirements of the users. There have, of course, been thousands of user studies over the past twenty years, but the vast majority of these are of such a trivial nature as to contribute nothing of permanent value. In contrast the projects directed by Allen and Garvey, in common with those of Salton and Sparck Jones, have continued over a number of years, building up a body of knowledge from which new projects can be launched.

To sum up the work of the past twenty years, considerable knowledge has been acquired concerning the general properties and characteristics of information retrieval systems. Some of this knowledge has come from the negative results which have been mentioned in this paper; unsuccessful attempts at automatic indexing, for example, have indicated that the present state of knowledge concerning linguistics is insufficient to permit effective operations of this kind. More positively, there are a number of facts which can now be accepted as generally true, in so far as positive proof is ever possible. I have elsewhere quoted Wilkins: 'no theory can ever be proved to be true; it is held for so long as no better theory can be found'. With this proviso, it can be argued that there is a substantial body of experimental evidence which suggests that the following hypotheses, amongst others, are correct, with at present no evidence to suggest the contrary:

(1) There is an inverse relationship between recall and precision if, within a single system, the results of a number of searches are averaged, assuming that the sequence of sub-searches is made in a logical order.

(2) In any given system there is an optimum level of exhaustivity of indexing. Below this optimum level, the recall of relevant documents will be adversely affected; above the level there will be a serious drop in precision.

(3) For any given system there is an optimum level of specificity of the terms in the index language.

I would not wish to designate the above as 'laws', but they do appear to be fundamental principles affecting all IR systems. In applying these principles, we can observe a number of facts, such as that, in a surprising number of cases, the optimum level of the specificity of the index language appears to be single terms in natural language (i.e. the language of the indexed documents) with the small control of confounding word forms. We can also observe in a number of cas
that accepting the words in a title or abstract as the set of indexing terms
give equally good performance as having the documents indexed in a conv
tional manner. However, it would clearly be absurd to claim that these
basic principles; they are facts observed in certain environments (usu

mechanized systems) and quite obviously do not apply in other situations such as, for example, printed indexes. Technically, as a result of the previously mentioned work of Sparck Jones and Salton we are aware of a relationship between exhaustivity and specificity and can show that it is possible to make one compensate for the other. This is most important since it relates to the over-riding factor in all operational systems, namely the necessity of maximizing cost-effectiveness. We now know that there is no single method or technique which can be satisfactorily applied in all situations; the system designer has the option of achieving a given performance level in a number of different ways, and so long as the users are satisfied with the result, the most important criterion in making a decision concerning the various alternatives would appear to be cost. Techniques and measures have been developed to determine the performance and cost of any operational IR system, so that the optimum cost-effectiveness can be achieved.

Any suggestion that we have come to the end of the basic research that can be done in experimental environments is not one to which I could subscribe, but one has the feeling that research in experimental environments is becoming far more difficult, has to be carried out in considerable depth and successful or useful results cannot be guaranteed. On the other hand there is a considerable area that requires investigation in operational environments. Our knowledge of user requirements and habits is limited; should we bend users to the system, or is it more efficient to bend the system to the users? How far can we, or should we, go in meeting the varied requirements of individuals in a group of users as against treating them all as the same type of person? There are many such questions to be answered; as such work could only be done within the context of the operational systems, it is therefore likely to be difficult and expensive, but if carefully planned, should provide useful results that could be fed back and stimulate new basic research.

One can never justify operating a system inefficiently, but this is not the same as saying that one can never justify the operation of an inefficient system. One can have a system that is as efficient as our present knowledge, techniques and capabilities permit, but unless it is used it has less practical benefit than an inefficient system which meets a real scientific or technical need. I feel the stage has been reached where we should be able to judge whether a system is operating efficiently or otherwise, but we know little about the value of the systems. It is this area which, more than any other, represents the challenge for research over the next twenty years.

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DISCUSSION

THE DIRECTOR thought that one of the most significant developments was the change in attitude towards research between 1954, when only two speakers at the Annual Conference of Aslib had supported a proposal that Aslib should engage in research, and 1958 when the DSIR grant terms to Aslib had not only accepted that research was an appropriate activity for Aslib but had offered enhanced grant terms on condition that Aslib developed a research programme. In his view, the commitment to research in library and information operations in the UK dated from that development, and the next logical step had been the establishment of OSTI when DSIR was disbanded in 1965. There had been two further decisive steps in the growth of Aslib's own research. Firstly, OSTI's first task after its creation had been to examine Aslib's research potential, and the resulting Working Party Report had offered increased grants in support of research, and had identified agreed areas for Aslib's specialization. Secondly, a number of member companies and nationalized industries had contributed approximately £40,000 to support expansion of the research programme over the years 1967–9. This industrial commitment to Aslib's research work had been most significant; he hoped that industrial members would now give increasing help not only with finance but with the definition of objectives. THE DIRECTOR thought that there was still a gap to be bridged between Aslib's research and its application, as appropriate, by member organizations. Various ways of making the practical implications of the research better known were under consideration.

MR J. MILLS (North-Western Polytechnic School of Librarianship) said that Mr Cleverdon in querying the assumption that a controlled index vocabulary was a fundamental necessity, had considered them relevant to printed indexes and to the physical shelf arrangement of documents, but not to mechanized retrieval. The presentation, however, of indexing information (including, perhaps, abstracts) in some linear sequence, was likely to remain with us for a very long time indeed and this inevitably raised problems of filing sequence and citation order which only a controlled language could meet. The same was true of the physical arrangement of documents on shelves, in filing cabinets, etc. This was also, strictly speaking, an index to the whereabouts of possibly relevant documents and as such was badly underrated as an instrument of retrieval. It may well be beneath the notice of those preoccupied with more sophisticated methods, but in some areas it was not ignored: e.g. in the Construction Industries these two agencies of retrieval (linear indexes proper and shelf arrangement) were still very important and a Building Research Station report on data co-ordination had concluded that a common controlled language could play a valuable role in existing communication and retrieval in the industry, and, in fact, the North-Western Polytechnic and the Brixton School of Building had been commissioned to produce one. As to mechanized retrieval, whilst Mr Mills thought an important element of the SMART system's strategy was its acknowledgement that a variety of index devices had a contribution to make to retrieval and that an eclectic mix of these was most effective, these were exemplified in the different 'dictionaries' or options provided by the system and one of these was a generic hierarchy, albeit a modest one. Indeed, it was difficult to imagine a retrieval system which did not utilize, implicitly if not explicitly, this quite fundamental relation.

INNOVATION RESULTING FROM RESEARCH AND DEVELOPMENT IN THE INFORMATION FIELD

1. A Researcher's View: The Detection of Innovation

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RESEARCH can mean many things, even after we rule out its use as a label to raise the rank of institutional pecking order or the thinking of beautiful, but unverifiable, thoughts. Here I will regard the research man as a thoughtful artisan. That is, as a craftsman who steps back from his immediate task to look at it in relation to something else, and then turns back to his task to change it or, even better, to make it unnecessary.

Clearly research is not the monopoly of science or of academic activities. It is not a topic, but a procedure. Apart from the urge to do it, it demands but two things; one personal, the other institutional. The first requirement is decent skill at some craft, no matter what. The second is occasional opportunity to stand back and consider. By bad tradition, official opportunity for contemplation is usually denied to administrators and managers, however thoughtful and skilful they may be. All too often they are compelled to deal exclusively with strings of immediate decisions that require no warming up period and have no carry over from one to the next. Indeed, for this kind of decision making, one decision should not affect or colour the next. That is all very well for the exercise of habitual skills, but to stand back and consider one must have a warming up period. To the external observer or unsympathetic employer this may be mistaken for idleness, a trance, or the fidgets. Nevertheless it is essential. Following this one must have a reasonable period free from what may be called, after their archetype, Persons from Porlock. Persons from Porlock have many powerful weapons, but none more potent than the telephone.

Given genuine privacy, possessing some particular skill, and taking the opportunity to extend and alter one's viewpoint, anyone can do research about anything. Judgements on the research must be based on results, not on the topic. In our enormous field, profitable viewpoints arise by turning one's back, by standing on one's head or, especially, by sticking one's nose into what may seem to be other people's business. This last is a tricky business. Some decades ago when I attempted to apply some elementary mathematics and statistics to very minor administrative matters, I got short shrift from Authority. I was told, with more force than courtesy, that administration was reserved for the elect—to wit, graduates of a certain English university—and that, whatever my technical abilities, my social status was at best that of a talking dog. Such an exhibition was exceptional then as it would be now. I was not offering advice, but exercising my proper skills, but even the most gentlemanly of men can resent being taught their jobs by people who have yet to learn them. On the other hand most specialists appreciate and, indeed, seek help from other specialists who observe the mutual respect that should exist between craftsmen.

For us this mutual respect is not only a social amenity; it is essential for innovation. Because we deal with what people have to say, all our activities manifest themselves on several levels at once, ranging from the physical to the social. At bottom they are all social. We deal with physical events only if they can represent or facilitate human communication. We are not directly concerned with how the universe carries on when there is no one around. Nor are we directly concerned with individual thought processes whose owner cannot communicate in language. But between these extremes—the impersonal public universe, and the personal private mind—we can and do use just about anything for anything.

To do our jobs each of us has had to specialize. No one of us can possibly be aware of, let alone competent to judge, equipment, procedures, and principles from other fields that might be helpful in ours. Indeed some such imports, especially of principles and theory, have been disastrous, because they have been moved out of the areas in which they held good, and their terms made sense. Nevertheless there must be much that is a matter of course, or even unsuccessful, in other fields that would be valuable innovations if used differently in ours. For it is well known that the major effect of inventions is rarely what they were designed for. The printing press was to aid scholars and rich men. The motor car was to be a horseless carriage for 'carriage folk', rather than a means of portable privacy that made chaperones obsolete. The pedal cycle became a major instrument in the emancipation of the labourer; the sewing machine, of his womenfolk; the typewriter, of educated women.

To make use of potential innovators we need serendipity in the original sense of that word. That is, the knack of making accidental discoveries that are useless for your immediate purpose, but useful for something else. A typical example, which antedates the term itself, is the anecdote of John Aubrey, telling of a wife who tried to poison her husband by boiling a toad in his soup. She succeeded only in curing his dropsy.

Serendipity, the recognition of items that may interest his customers, is one of the characteristics of a good librarian. The problem is how to get the same ability exercised on the librarian's behalf. The best way is to find someone who knows just about everything that is going on, and can spot what of it can be applied usefully to what else. Then you have to put him somewhere in the organization where this rare ability not only can be, but actually is, made use of. How this is to be done I cannot tell you. All I know is that it happens sometimes.

Nevertheless there are ways of detecting, or increasing our chance of detecting, potential innovation or the early stages of innovation. Before outlining these I will mention briefly a very special but important variety of serendipity, arising from the increasing complexity of activities, procedures and materials. By 'complex' I denote what is often called these days 'sophisticated'; I do not know why. Often the complication, precision and uniformity of input and of ancillaries far exceeds that required in the ostensible output. Sometimes one can only get hold of a component or material because it occurs in or is just used to wrap up or contain something else. This is not altogether a contemporary situation. In the last century the large cubical tins of Huntley and Palmer's biscuits were bought by dwellers in the tropics not for the biscuits, but for the tins which were proof against white ants. Indeed, some Bibles translated into African tongues were made in a rather squat format so that they could be packed efficiently into these tins. Similarly the old two gallon gasolene cans were valued not for the gasolene, which was useless in that social context, but in their own right as modular building units, either filled with earth or hammered flat. In our own times we are learning to live, or die, with the fact that the contents of any normal home can provide the ingredients for improvized lethal weapons.

This kind of serendipity, use of complex equipment as a source of material for some simple purpose remote from that it was built for, is sometimes called the Inverted Robinson Crusoe Syndrome. It is not confined to material objects. Many of the branches of mathematics recommended to, or urged upon, library science exhibit Inverse Robinson Crusoeism. What are of use to library scientists are not the theorems of, say, Graph Theory, Set Theory, Symbolic Logic, and so forth, as such. Apart from some very elementary ones, common to most of mathematics, these theorems deal with special mathematical concepts that can have no physical or social realization. What they do have, in their introductory stages, are notations, methods of display and, above all, well defined terminologies for many formal matters that we have to talk about. This shows that as well as serendipity we need to judge what, and how much, is worth accepting. In short, we must not only decide whether we need roast pork, but also whether we have to burn a house down to get it.

Besides exploiting of materials and procedures deflected from their original targets we can recombine and rearrange. Typewriters and carbon paper were around before someone thought of combining them, thus converting the typewriter from just that to a short run duplicator. An example of anti-innovation caused by rearrangement is the habit of management, especially in these islands, of acquiring with much trumpet blowing some expensive labour-saving device, and then hiding it away lest anyone should use it.

Just about any selection of things, processes, and ideas can be combined, rearranged, and diverted to other ends. Also there are the genuinely original innovations, arising one knows not how. I cannot advise on how to select, let alone create, those that will be or even may be fruitful. However there are methods for detecting them after they are at work, and for predicting the kinds of innovation needed. In physics and engineering these methods are based on what are named Scale Effect and Dimensional Analysis. In any well defined situation, physical or social, there are units that are natural or intrinsic to it. For instance, we all know these days that for swift enough aircraft the natural unit of velocity is the local speed of sound; that is, the speed of the compression wave produced by the aircraft. If the aircraft flies at less than this speed, the compression wave gets away from it and has no effect. If it flies at more than this speed, it is always in its own compression wave, and the whole pattern of aerodynamic behaviour is changed. This is the importance of the Mach Number, which is the ratio of the aircraft speed to the speed of its compression wave. Similar intrinsic units and significant ratios can be found, by those who look for them, in managerial and social contexts. A fundamental financial ratio is that of annual expenditure to annual income. This I call the Micawber Number.

Every definable, and therefore, repeatable, social situation has its own proper units of time, space, mass, cost, duration, delay, numbers of people, numbers of staff, numbers of words, of letters, of symbols, of costs of various kinds in terms of money or time and inconvenience, and so on. Any change in materials, devices, processes, or procedures that alters or is expected to alter the absolute or relative values or the general balance of these quantities is a potential source of innovation. Consider, for instance, the effect on office clerical work of Xerox copiers; and on the laws of copyright, and the musical industry, of cheap and portable sound recorders. In both these the delay caused by some ancillary task has been reduced from very much greater than that of the main task to very much smaller. The tape recorder has also, within twenty years, achieved drastic alteration of weight, price, size, convenience, availability, and popularity (in the sense of non-rarity).

The effect of numbers of users is often overlooked by crystal ball gazers. Though many technical predictions of the last century were correct enough functionally, they all assumed that motor cars, radio, television and rapid transport would be used only by a few rich people, and telephones used only in offices. More recently they have assumed that only technically skilled people would use movie cameras, sound recorders, computers, and copiers. There still lingers a belief that library services are only for an élite.

These are very complicated cases of innovation. I will take a very simple example to illustrate natural units. Consider a wristwatch. This is an instrument, and is therefore essentially social. The physical universe does not use wristwatches, any more than it uses dictionaries and grammars. The physical universe does not use anything; it just happens to be around (for the purposes of this paper, anyway). The watch, being a social instrument, must have some agreed symbolism for indicating the time; either accepted by a group of people, or specially designed for, or by, the user. Associated with this will be various characteristic quantities concerning the number of distinct symbols, how they are indicated—e.g. by flip-over mechanism or by pointers—and the weight and dimensions of their physical representations.

To the user of this watch the internal mechanism is of no interest, so long as it works. But one has only to remove the hands, and erase the dial markings, to reduce the watch from a social tool to a pure mechanism, of engineering interest only. The physical alteration is trivial, but it completely alters the nature of the device, the criteria by which it is judged, and the kind of intellectual discipline needed to formulate these criteria. The same situation arises if you erase the digits from the wheels of a desk calculator. To the engineer it is unaltered except in appearance; to the user it is no longer a calculator. Failure to make this fundamental distinction caused much of the confusions and conflicts in the early days of automatic computing and—as I know to my and other people's cost—in the classification of computing literature. At bottom, the confusion is between function and operation. The first necessarily involves the question, 'Why?', the second 'How?'

I return to the watch. As a mechanism its natural unit of time is about one-fifth of a second for an escapement watch and about a millisecond (I think) for a tuning fork watch. For the user the natural period is not less than twenty-four hours. A watch that had to be wound at intervals of less than twenty-four hours would be a nuisance. On the other hand there is no point in increasing the running time unless you can increase it to seven days at least. Few people would take kindly to a watch that had to be wound on Monday, Thursday, Sunday, Wednesday, Saturday, Tuesday, and Friday in succession.

Other examples of physical units of time conflicting with social units are the recharging time of nickel-cadmium batteries (around sixteen hours) and the actual flying time in air travel. This can be less than the time required to recover one's baggage on arrival, or even so small in relation to the total travel time that it would make no significant difference if you flew at infinite speed. Nearer to the worries of this Conference are the delays required for printing, copying, recording, listening, reading, distribution by postal services, getting hold of the right person or item, and putting the item away in the right place.

The wristwatch as a personal instrument is on an entirely different level from the wristwatch as an engineering product. Public devices, involving more than one person, are on yet another level, involving matters not arising with individual activities. Consider a man with a ladder. So long as it is big enough to do the job, not too big for the man to handle, and the man knows how to use it, all is well. The man does not have to describe how to use the ladder in words, he does not have to know how he uses it. All he needs is to be able to use it, and to do so.

Suppose now that the job demands a ladder too big for one man to handle. Then the major problem becomes one of communication between the men at the opposite ends of the ladder. If for 'ladder' we substitute 'library' we are right up to our necks in the fundamental problems of Information Retrieval and Pattern Recognition in general. These are delegation as opposed to substitution, and storage and retrieval as opposed to recognition and recall.

These homely examples show up the need to keep distinct the various levels at which any situation involving human behaviour, especially linguistic behaviour, may be discussed. At the physical level, things are what they are, whatever people may say about them. At the social level, things are what enough people say they are, whether the things have any independent existence or not. In between there are many other levels, none of which can be explained in terms appropriate to others. We have to avoid taking one man as being a small crowd, or a leg as being a small man. We have to avoid, with even more care, the converse error of taking a library system as a large brain or as a large thermodynamic system. Aspects of library systems do involve brains and thermodynamic systems, but these are aspects of the system, not the system itself.

As an exercise in sorting out levels, one can compare Whist, Auction Bridge, and Contract Bridge. These being games are social to start with, but cannot be played without an appropriate physical environment, and a technology that can produce material objects—the playing cards—of acceptable qualities and at an acceptable price. Playing cards have been fairly widely available for some time, so have been the procedures for taking tricks. The innovations here have been in new rules, and newer rules for changing the rules during a particular play of the game.

We have much to learn about spotting or initiating innovations of procedure. We cannot even tell whether an experiment is a valid model for larger or smaller collections or bodies of users or range of subjects. We do not know what are the least number of operations needed to perform quite simple computational or managerial tasks. We do not know whether an on-line data retrieval search or a pattern recognition device of the 'perceptron' type will ever lead to a result, however long the sequence of operations, even if they work for limited targets. We do not know whether an enlarged thesaurus or key word list may not be as ineffective as an enlarged flea. In short we do not know how to build valid small scale models of social situations.

The physical aspects of these situations we do know how to model, or to test the validity of a model. For this we use the Scale Effect method mentioned above, together with its powerful but tricky development, Dimensional Analysis. Broadly speaking, you first enumerate the essential entities involved—length, mass, time, charge, and so forth—and then insert them into the known equations governing the behaviour concerned. By checking that we are equating cows, say, on one side, with cows on the other, and not with miles or Information, we can derive a set of pure numbers. These, like the Mach Number and the Micawber Number, must be the same in model and prototype for the same type of behaviour. The numbers represent the balance of effective influences.

This method is perfectly valid and extremely useful for all aspects of a social system that involves well-defined terms and well-defined laws. So we can use it, and should use it, for all physical aspects up to and including Shannon's Information Theory. Beyond this we cannot go in physical terms alone, because the phenomena are on a different level. William Blake, who had a good eye for methodological levels, summed up the limits of the purely physical approach thus: 'The microscope knows not of this nor the telescope; they alter the ratio of the Spectator's Organs, but leave Objects untouched.'

Thus, to make valid models, we have to get hold of the objects and entities involved, and be sure that we and our colleagues can identify them without ambiguity and conflict. We do not do this by using terms that are so vague that, while their meaning is clear enough, we cannot tell when they apply, e.g. the word 'important'. We do not do this by using terms that are ambiguous; e.g. the word 'information' used to denote knowledge, recently acquired knowledge, unknown knowledge, sheets of printed paper, sequences of signals, sentences, words, the entropic measure of average variety or, indeed, just about anything the user is too lazy to identify. We do not do it by using words that refer to nothing whatever; such as 'information' to denote a non-existent self-sufficient phlogiston-like essence, that is pumped around like unnatural gas.

It is done by disentangling the key phenomena of documentary and bibliographic behaviour, and then explaining them in their own terms, not in terms borrowed through false analogy from other disciplines. This means hard work for small gains and large disappointments. Fortunately most of us work this way. But not all do.

As I have hinted already, some of the most acute problems that hold up our progress involve multitude; numbers of users, numbers of documents, numbers of subject headings, of index terms, of requests, of sources, and so on. We just do not know how these affect systems. Evidence suggests that there is a whole series of critical numbers beyond which a particular system breaks down and must be replaced by another. This certainly happens in computing and in pattern recognition, where the number of operations may increase factorially; for example, recognition of a ten-fold increased repertory of patterns may demand around a three and a half million-fold increase in elementary operations. This flies a storm signal for those who wish to enlarge computerized 'key word' systems indefinitely. These resemble 'Perceptron' pattern recognizers enough to suggest that they are vulnerable to the same ills.

One fruitful approach to the problem of multitude is to couple it with time in the sense of historical sequence. This is not a novel comment. Librarians always have taken into account, or appealed to, the history of their documents, customers, and topics. My complaint is that this has not been sharpened into a set of explicit tools. Some twelve years back it was shown that many problems of classification, retrieval, and 'relevance' had no unique solutions unless viewed in the light of their history. Also that the light of their history showed certain targets to be unattainable. Static snapshot views threw essential elements down the drain. This line of approach has been strangely neglected. Citation indexing as such has been much extended in application, but its generalization and implications have not been followed up. Much more heartening is the work of Goffman and his collaborators. They are developing, from mathematical analysis and empirical observation, a qualitative theory of the spread of published ideas in terms of epidemic and control theory. Others are studying managerial situations in terms of growth and process. But too many documentary tasks, such as grouping of topics or keywords or index terms for classifications, concordances or thesauri, are still considered as static arrangements.

What we urgently require for efficient practice are efficient theories. We will have to wait a long time for a comprehensive theory. Physics has not achieved this yet, even after three and a half centuries. But fragments of theory about fragments of our job would be better than an enormous cook book of unrelated empirical procedures, from which we can infer nothing.

A theory demands a language to be expressed in. In the early stages one uses colloquial 'natural' language, even to talk about language. In time this becomes defined precisely enough to make precise statements. This time is turning out to be much longer than it should be.

Also we need various symbolic or mathematical languages to talk about formal aspects. Otherwise we will be bogged up in lengthy circumlocutions whenever we have to talk about formal matters ordinary language does not provide for. The formal aspects of documentary systems in particular, and managerial systems in general, deal with the enumeration, deployment, and control of variety according to various and changing ideas as to what constitutes variety; that is, what are to be regarded as distinct and what as the same in particular applications. As I said earlier, the necessary terminology and elementary concepts are found spread around the roots of many special branches of mathematics. It is more convenient for all, and necessary for some, to seek them in that branch of mathematics that deals specifically with variety in its own terms. This is what is now called Combinatorics or Combinatory Analysis. For some this may evoke the phrase, 'Permutations and Combinations'; for others, just a shudder. But whether we shudder or not, our working life compels us to use and talk about the notions of combinatorics. For instance, we have to select distinct chairmen for different committees. Can it be done? How do we do it? If two thesauri group the same terms in different ways, is there a set of terms that will be grouped in the same way by both classifications? The various diagrams and calculations about common and joint membership of collections belongs to combinatorics, not to Boolean algebra, set theory, symbolic logic and the rest, as such, though they have obvious applications there. Only specialists need to be practitioners in this field, but everyone should be able to specify problems clearly, and to apply the solutions.

Combinatorics plays the same part in management as geometry does in architecture. It is not the whole story, of course. It can deal only with formal matters, and even for formal matters other tools may be needed. Bill Goffman for instance is skilled in the profundities of control theory. I have a fairly wide acquaintance with the superficial aspects of the weaker algebras and cognate topics. These are just individual tools, not universal ones, we have chosen as suitable for our individual routes towards the grail.

I have referred to the need for more theory. In most environments this would call for no comment. Practice and theory are regarded as aspects of the same reality. Most of my life, almost forty years, was spent in an environment where separation of theory from practice was lethal, for me as well as for others. So I am still startled when people speak of theory as something immoral, not to be practised even in private between consenting adults. 'That's only theory!' they cry, from the back of the hall. 'Only' theory, indeed! How do they think we reached the moon?

An equally disastrous view is that theory is a magic spell, dispensing instant solutions to all practical problems. No theory of anything is complete enough to cover all aspects of any practical problem; that is, of any problem arising in the real world.

Clearly there is some confusion as to what a theory is, what it can do, and what it is for. A large and growing library could be filled with writings on this topic. I will try to sum it up in a few sentences. I will exclude formal theories, such as you get in mathematics, and consider only theories relating to observable phenomena. A theory is here any body of principles and rules of inference that allow you to derive useful conclusions. You start altering the theory as soon as it ceases to provide useful conclusions. Theories of empirical phenomena necessarily are based on postulates of ignorance; they start out from assumptions about what you cannot do, however ingenious or well equipped, except by chance. In our field the main postulate of ignorance is 'You can't tell whether a statement is true just by looking at it, or by performing computations upon it'. This does not sound very helpful, but in fact it is, not only eliminating impossible targets, but also immensely clarifying some otherwise very muzzy issues. Put otherwise, a theory deals with what is necessary, not with what is sufficient. For you can always bring in or find matters outside the scope of the theory. This can be put more bluntly. A theory cannot guarantee success if you conform to it, but it can guarantee failure if you do not.

This paper has been about innovation, its detection and initiation. Its message could have been summed up much more sharply, as perhaps some of you are thinking. So here is the summary, true innovation is what makes something unnecessary. This goes for professions too. In ours we strive to make it possible for the reader to find out directly what others have said, without having to call us in.

INNOVATION RESULTING FROM RESEARCH AND DEVELOPMENT IN THE INFORMATION FIELD

2. The User's View

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I AM not sure whether I was asked to give this paper as an innovator, a researcher and developer, or a user. If I claim to have some elements of all three, this presumably exonerates me from having to be expert at any one of them. I should perhaps say that I see all three as closely interlinked: for me, at any rate, all worthwhile library and information research has arisen out of strictly practical problems, which present knowledge is inadequate to solve; and these problems occur to one as a librarian trying to give an adequate service within various economic, social and political constraints—the definition of an adequate service being arrived at by seeing the library through the consumer's eyes, and by using it oneself as a consumer.

In this paper, I shall include in 'innovation' not only innovation which has already taken place in libraries—there is little of this—but innovation planned or likely to take place in the near future, and potential innovation, awaiting the adventurous librarian. By 'user' I shall understand the librarian who, by innovating, is a consumer of research, and also the library user, who is at the receiving end of innovations.

At this point it may be worth asking why librarians, or some librarians, innovate. Mainly, I think, because they like it—they are that sort of person. Some librarians will not innovate however strong the research evidence is. They may follow the lead of others, perhaps some way behind; they prefer to wait and see what happens to those who do innovate (and sometimes what happens justifies this caution). Some will innovate on hunch; this is not always a case of 'It seemed a good idea at the time', since hunches may be based on long experience, sound observation and deep thinking, albeit this may be semi-conscious. However, the 'Let's try this and see what happens' approach need not concern us here, except when the experimenter attempts to evaluate his experiment by careful research. Some librarians, who *are* our concern, innovate as a result of research results and a spirit of adventure: every research pudding must be proved in the eating, and every innovation, however careful the research, must be something of a step in the dark. Libraries are, I suspect, somewhat delicate organisms, and to risk upsetting their functioning, and also their customers, requires either courage or folly. One of the great difficulties in innovating is that one would really like to try out an experiment on a small scale first, but circumstances either rule this out entirely, or the smallness of the scale alters the reality of the situation. This difficulty could not even be solved by setting up an experimental library, since the variety of experiments it would be necessary to conduct at the same time would make it impossible to establish controls and evaluate the effect of any one of them.

The effect of library and information R & D can best be illustrated by example. The examples I shall give are necessarily selective, but they all seem to me significant and potentially important. I might mention here one striking fact: that nearly all the studies that have been done relate to university, or occasionally to special, libraries. Staff in these libraries tend to be more research-trained and research-minded, and in universities academic departments may use their libraries (as Morse used MIT[1]) as a test-bed. It nevertheless seems a pity that more R & D cannot be done in public libraries.

My first example is the design of circulation systems. The University of Lancaster Library[2] carried out, as part of its research on an OSTI grant, a study of book issues, with a view to seeing whether the patterns of use revealed could lead to a redesigned system which would yield a greater level of current availability of books. I confess here to some suspicion about the search for statistical distributions in book issues; there is a danger that the issues will be seen to fit the distribution, or if they don't, a slightly different arrangement will see that they do. Morse[1] found that book circulation at MIT conformed more or less to a Markov process; Lancaster found that their issues conformed, more or less, to a Poisson distribution. In neither case was the fit so close as to be conclusive, nor for that matter is there any fundamental reason why it should be; for all we know, there may be a new distribution ready to burst upon the world, to be known as the University Library Book Circulation Distribution. It is important not to be blinded by statistical science, but to view such studies with scepticism. I am not criticizing Morse, or Lancaster, only uttering a warning to those who read their reports.

The important thing about the Lancaster study is that they acted upon it, and found it worked, with some modifications. Here again one must be sceptical, and not assume that it will work elsewhere. In this case we shall soon know, as a similar system is about to be adopted at Bath University. If it works, I shall bless Lancaster as researchers and innovators. If it fails, I shall blame no one, not even myself, but my users will; they may complain about the present system, and even make their own suggestions for improvement, but they will certainly not regard the changes, unless they work well, with any more sympathy because they are founded on research. Indeed, they may be rather *less* sympathetic: few things are more satisfying than proving experts wrong, and the honest muddler often comes in for less criticism than the careful academic—this is almost as true in academic life as it is in politics.

A number of use studies have shown, as indeed did the Lancaster research, that a small proportion of the stock accounts for a high proportion of use;[3, 4, 5] even in small libraries this is true. This has of course been known by librarians for a long time. What is something of a surprise is the smallness of the nuclear collection, even for research purposes. In this case innovation—if the creation of small undergraduate libraries and short-loan collections, and the segregation of part of the library stock from the main sequence for compact storage, can be called innovation—preceded the research, and the research can only be said to have accelerated trends which had already begun, usually for reasons of space.

On a different level, the relationship of local to national or regional stocks—the book hierarchy problem—has begun to receive some study.[6] I mention this not because any innovation has yet taken place, but because it is fairly certain that it will be enforced by economic necessity—the inability of local libraries to keep up with increases in the price and volume of publication—before it is prompted by research. Few librarians would, I imagine, voluntarily lower their financial estimates if research showed them to be buying rather more books than necessary, or if it was shown that of the total public money spent in this country on libraries, a higher proportion should be devoted to national collections. What research can do here is to provide either support or correction to trends which are bound to come; I suspect, for example, that research would show that many local libraries were on the verge of becoming too dependent on national provision, both in economic terms and in terms of the user's frustration level.

The most interesting, and potentially most useful, research so far carried out in this general area has related to the use of periodicals. Citation studies are far more numerous than actual use studies, for obvious reasons: except in a place like the NLL, where almost all use consists of recorded loans, no satisfactory method has yet been found of studying the actual use made of periodicals. All studies point in the same direction. There is a nucleus of titles which account for a very high percentage of total use, and the remainder follow a fairly consistent negative exponential curve. This is the now familiar Bradford–Zipf distribution,[7, 8, 9, 10] without an article on which no volume of any self-respecting library or information science journal is complete. The potential application of this is obvious, as it could help libraries to optimize their periodical holdings, and indicate what to discard and what to duplicate. It could, as Brookes suggests,[11, 12] show what should be held in a branch, what in a main library, or, at a national level, what should be held locally, what regionally, and what centrally. The theoretical soundness of this has now been adequately demonstrated, but there are several major obstacles to its implementation. If I dwell on these, it is not intended to reflect adversely on the work of Brookes and others, but rather to illustrate the difficulties of implementing research findings in practice.

First, application depends on the collection of a great deal of data concerning the use of serials. The nuclear journals are easy to identify, and it would be very surprising if a library did not have them already. It is in the next band, of moderately heavily used journals, that difficulties arise. Citation studies are of limited use only. This is partly because a certain journal, say in chemistry, which is heavily cited may not be within the range of interests of a particular chemical research institution or team. When the Aslib evaluation study[13] appeared, I brought to the attention of each School in Bath University those journals in their subject which received moderately heavy citations but which were not already received by the Library; with only one or two exceptions, these journals were outside the research interests of the University. A second reason is that a heavily cited journal may cost as much as ten other journals, less heavily cited but together accounting for more use. A third factor is that some journals may have little archival importance, and so receive few citations, but may nevertheless be essential for current information (this is especially true in technology). So we are reduced to collecting detailed data on the use made of journals, not only of those the library already has, but of those it might have. Data on the latter are rather easier to collect, as their use may be recorded as inter-library loans; but unrecorded consultation of other libraries may take place, and in any case one cannot predict the use that would actually be made of them if they were on the spot, particularly use made by scanning current issues. Brookes actually suggests[11] *predicting* the use that will be made in the coming year, an even more difficult exercise. But let us assume we have collected all this information about each journal. Now if I had all this information I certainly would not bother to plot it on a Bradford–Zipf curve—I would *know* what to do, and in any case I would need to look at the price of each title. Bradford–Zipf can at most give me a rough indication of whether my periodical intake is about right, but it cannot tell me how to do better, since this depends on individual decisions about individual titles. If I seem to be dismissing B–Z as an interesting game, any B–Z addict can easily prove me wrong by applying it to an actual library situation and improving the situation more significantly, or with less effort, than could be achieved without B–Z.

Of more practical value is the Gordon Williams study.[14] This still requires data on extent of use, and moreover requires the detailed costing of periodical processing in one's library, but it does at least tell you what to do when all the data and costs are collected. What is disturbing in this study is the difference between different libraries in their processing costs. A bit of research as to why these enormous differences exist might lead, if not to innovation, at least to a few sackings.

The major problems facing most librarians are how much money to ask for, and how best to allocate the resources they have. The obvious answer to the first is 'as much as possible', but as the librarian's competitors for money will also be asking for as much as possible, victory will go to the strongest or the one who can produce the best arguments. There are at least two ways research could help here: in indicating what provision is necessary to meet demands or potential demands on the service; and, much more difficult still, in showing the relative contribution library and information services make to the objectives of the firm, institution, or community served. Perhaps I could mention here two very small pieces of research I have carried out in my own university on minimum levels of provision. In the first, I asked researchers to note references they came across and wished to follow up, and then to record whether they were in the library or not. This was asking a lot of them, and the response rate was poor, but it did give some indication of the level of availability. In the second, undergraduates were asked on four sample days to record what items they had come to the library to look for, and whether they were available (a further check was subsequently carried out by the library staff against the catalogues). In both surveys, the availability was below 50 per cent. To have obtained all the unavailable items on inter-library loan would have been uneconomic, and in any case users could not always wait for an item to arrive; undergraduates in particular presumably went without. The only innovation I could have imagined following these very modest pieces of research would have been to close shop entirely; I have not however done this, yet. As with much library research, it was impossible to do this without the users' co-operation; in spite of careful explanation why the survey was being carried out, co-operation was not always gladly given or forthcoming at all. The user's view of library research is sometimes a harsh one, whatever his view of innovation may be.

On the other questions—what the library contributes to the parent institution, and how best to allocate one's library budget—some work has been done, notably at Durham University by the OSTI-supported Project for the Evaluation of Benefits from University Libraries.[15, 16] An inescapable difficulty here is that value judgements cannot be avoided, and their incorporation into any model raises serious problems. The recent book by Raffel & Shishko[17] goes as far towards meeting the difficulties as any work I know, and we may hope for more progress in this most important matter. Incomplete though work in this field is, it has already led to a greater 'optimum-consciousness' on the part of librarians, and by this I do not mean merely that the word 'optimization' is heard on the lips of librarians more often. Merely thinking consciously in terms of optimization can lead one to analyse a situation more clearly and deeply; for example, even if one cannot quantify the precise costs, let alone the benefits, of expenditure on reader service as compared with processing, to look at them in this way is often illuminating, and can lead to significant changes.

The catalogue has been discussed a good deal recently, partly because the possibility of automation has raised questions as to what sort of catalogue is really wanted. Studies of catalogue use have so far reached two main conclusions: first, most users do not use it at all if they can help it, and when they do, they find numerous difficulties in its use;[18] and second, titles tend to be remembered more accurately than authors.[19, 20] It is also known that cataloguing is very expensive.[21] Additional entries under title would of course add to the cost, but not very much, and it is rather extraordinary that libraries which spend a great deal of loving care on author catalogues should not also provide title catalogues. Improving usability is less easy; computer-produced book catalogues, which are in a familiar form (the codex) and can be reproduced for distribution, may help to solve the problem. The cost of automation may however be such that it can only be contemplated if the basic costs of cataloguing are reduced, and this raises the question of what sort of catalogue we want. Perhaps I can claim as a small innovation, at least for a university library, a mini-catalogue we are currently preparing, with the aid of the computer, from the existing card catalogue; in this, entries are reduced considerably (author and initials, short title, edition, and date), and we shall, I hope, be able to compare it with the card catalogue both as regards content and usability; a title catalogue will also be produced, and perhaps a KWIC index of significant words in titles. The cost of cataloguing in mini-form is a good deal less, both because of the brevity of the entry and the unimportance of establishing a 'main' heading. It will only be a true innovation if it eventually supersedes the card catalogue and conventional cataloguing; until then, it is still partly a research operation, and illustrates the inseparability of research and practical innovation—by the time it is a real innovation (rather than a cautious experiment) it is no longer new enough to deserve being called an innovation, and it is based as much on practical experiment as on research. Since the products of this experiment will be extras, at least to begin with, users are hardly likely to suffer from them; but if they do not like them, they will undoubtedly complain about the expenditure of time and money.

The research and development done by the Library of Congress and BNB which has led to MARC is relevant here. MARC itself is a major innovation, though it was bound to happen with the advent of computers. The invention of PRECIS[22] is an innovation based more directly on research, possibly a major innovation: I say 'possibly', because it still awaits proper testing before it can be used with any confidence on the scale for which it is intended. It is an interesting fact that while a great deal of research has been done into indexing languages for scientific reports and articles, there is virtually none into indexing languages for monographs in all subjects. The way we arrange books on our shelves, our classified and subject catalogues, are based largely on tradition and local inspiration. Work on subject access to scientific papers has shown, among many other things, that the type of language used does not make a vast amount of difference, and that, beyond a fairly small number of index terms per item, the law of diminishing returns operates very rapidly. It would be most interesting to know whether this is at all true of monographs.

Automation generally has had a great impact on libraries. Some types of library, notably university and special libraries, have been much better placed to make use of automation, because of their better access to computers. However, within these categories some libraries have been much more venturesome than others; it would not be tactful to say more than that there are few surprises among the venturesome libraries. A librarian who automates has to convince or convert his staff, and risks the opposition of diehard conservatives to whom computers will only be respectable when they appear in museums (perhaps it should be pointed out to them that this is already happening—the Smithsonian, for example, has a fine historical display of computers). He also risks the chaos that can result either from inadequate preparation or computer breakdowns; some examples of the chaos[23] have been recorded in the literature, with unusual honesty. Users may find they have to conform to more precise routines—for example, of borrowing books, or suggesting books for purchase. More fundamentally, automation has brought about some radical rethinking of library functions and operations, which may lead at least to changes in emphasis, at most to a new sort of library.

One important innovation in the last two or three years has been the introduction of information services into university libraries—a pretty secondhand innovation, you may say, since most special libraries have had such things for years. However, the differences between special and university libraries are great enough for this to be considered a true innovation. Beginning with

Southampton University Library a few years ago, it was given a major impetus when OSTI supported scientific information officers in six selected libraries, in addition to the one in Bath, who is concerned only with the social sciences. This innovation is based partly on the proved value of information officers in special libraries, but mainly, in my mind at any rate, on a variety of research carried out: into the scatter of references (leading to difficulty of use), the inertia of users, and the complexity of information systems. I have made this case in more detail elsewhere.[24] The impact on the library organization and on users is likely to be profound. In its fullest form, a reorientation of library services is involved; and this means that the library staff must be restructured (not to say converted), and that the user will obtain a far more immediate and personal service. This in turn may affect his information habits profoundly.

A good deal of development, and some research, has been carried out since the war into the effectiveness of 'nonconventional' media—teaching programmes, video-tapes, audio-tapes, and a variety of other aural and visual devices. In education these are potentially very important—I stress 'potentially'—as substitutes for conventional instruction, and the Open University may give a further impetus to them. So far, a few school libraries, and some college of education libraries[25] (notably Coventry College of Education), have attempted to integrate, or at least combine, them with books; among university libraries, Sussex University Library already has responsibility for all media, and has recently received an OSTI grant to develop and assess their use. Bath University is also providing a reasonable range of reception devices, including CCTV, in its new library. I would expect public libraries to develop very rapidly in this field in the next few years; it is even possible that by 1980 they will be a more important source of such things as video-cassettes, for use at home with television sets, than of books, because video-cassettes will be beyond the purse of most individuals, while books, especially in paperback form, will be within the purse of more and more individuals.

This is another area of innovation with a potentially great impact on users and librarians. Librarians will have to become familiar with the nature and technology of a whole new range of materials, more difficult than books because there is usually no equivalent of the title-page, and they mostly require machinery to use them at all. Users may develop a greater self-dependence in learning, and the whole learning process—about which we still know alarmingly little—may be affected. Exposure to a wider range of information devices may have an effect as profound as, and similar to, that of radio and television.

The foreign-language barrier has been well documented.[26] Dr Urquhart's solution[27] is for scientists to learn more foreign languages, so that every team has among its members a wide competence. This would not affect the library, but I regard it as an expensive and inadequate solution; a national translation service, backed by local translation services in individual libraries, would almost certainly be more cost-effective overall. Again, many large special libraries and information services have their own translators; it remains for university and perhaps public libraries to follow.

The largest area to date I have left to last in my catalogue of examples: the development of computer-based retrieval systems. This also is well-documented, both in general[28] and in various applications in special libraries. The impact of this is of course tremendous, and will certainly increase; in many libraries, manual or semi-mechanized services are being, or have been, superseded by computerized systems, whether these are based on local subject analysis or nationally available services such as those provided by UKCIS. The effect on the librarian is clear enough he has had to become competent in new techniques, and he has sometimes had to divert resources from other areas of library expenditure. The effect on the user is less clear. In general, he appears to appreciate the additional services, but he also comes to expect more. This is most clearly shown in on-line systems: a user expects the computer to respond to him quickly, and a ten-second delay seems less tolerable than a ten-minute delay when he consults a reference librarian. He is also more critical of any failures in the system, and he will curse the computer for not doing completely something that could perhaps not have been done at all before.

Direct and deliberate innovation in libraries is somewhat rare, especially in larger libraries, where the size of the system is such that radical changes cannot be made lightly. More common is a gradual development which is only recognized as innovation in retrospect, but which may nevertheless be profound in its implications. Some of the innovations I have mentioned are indeed far-reaching; automation, non-conventional media, computerized retrieval systems and information services—any of these alone could make a great difference to libraries, and together they would result in a library quite different from those with which users have been familiar.

When innovation does occur, it is rarely based directly on research; more often it follows research at several removes, when the findings of research have become so established and accepted that the connection is barely detectable. A great deal of research in information science has had no impact at all on libraries; this is partly because of the extreme difficulty of some applied research, notably in the evaluation area, and partly because even the potential relevance of research is exceedingly hard to detect. Few librarians wade through the mass of literature in information science in the remote hope of picking up something actually useful; those librarians who read this literature for interest probably build up a useful store of background knowledge, some of which may shed light on practical problems from time to time, but this alone would scarcely justify the time and effort involved in reading. Speaking as a librarian and a potential user of research, I would say that there is too little research of obvious relevance; the fact that when it is relevant it is usually inconclusive is due not so much to its quality as to its paucity—few problems can be solved by one piece of research.

As for the library user, his reaction is usually ignorance that any innovation has taken place, apathy if he is not ignorant, and hostility if he is not apathetic. Librarians can expect few immediate rewards for innovating. If the innovation is small, it may be unnoticed; if it is substantial, it may upset the sense of security of users (just as a husband's security is disturbed by a radical rearrangement of the furniture). If computers are involved, some breakdown or disaster is bound to occur sooner or later, and it will be greeted with triumphant glee as a sign that even computers have their faults (even though the fault is often traceable to human beings). If the innovation costs a lot of money, it is especially vulnerable to criticism. New services may be misunderstood or regarded with puzzlement because users have never seen them before, and no more recognize them as services than the first African explorers recognized the inhabitants as full human beings; unfamiliarity breeds contempt. A general improvement, say in the allocation of periodical funds, may result in an immediate hardship for a particular individual (nearly always an important one) who comes across a reference to a journal which has just been discontinued; general laws make good management sense, but are not usually welcomed at a personal level (just as people may be willing to accept the need for a policy of population control, so long as it doesn't apply to them). Library and information use is after all a very personal matter. If the librarian waits long enough, however, *and if his innovation is a sound one*, the librarian has the real reward of seeing his library run more smoothly, his funds better spent, and his users better satisfied. When I suggested earlier reasons why some librarians innovated, I omitted one very important one: that they want to explore new ways of giving their users greater satisfaction. And for all their criticisms and complaints, users do recognize it when their librarian has this motivation.

I have hinted once or twice at one very important factor: the open-endedness of innovation. For while we may know the probable short-term results of innovation, we have very little idea of its long-term effects. Libraries and information services develop in response to the needs of users, but they in turn affect the behaviour of users, and may come to change existing needs and create new ones. Computer-based SDI services could well have a significant and fundamental effect on the research process, as could audio-visual media on the learning process. This is of course true of any major innovation: when motor cars were invented, few can have had only an inkling of their total effect on society. And once an innovation becomes accepted, there is no going back, however ill its effects may prove to be: motor cars are here to stay. Research cannot predict these long-term effects: the best we can do is to use our imagination, to blend caution with experiment, and to observe as clearly as we can what happens when we innovate.

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DISCUSSION

MR C. W. CLEVERDON (Cranfield Institute of Technology) said that an important problem regarding innovation was whether one should attempt to bend the user to the system or bend the system to the user. In a library we may be justified in installing or operating a system that is economically inefficient if it appeals to users, rather than a more efficient system which is not acceptable to users.

MR LINE agreed and said it was always difficult to distinguish in research between the long and short term effects. A second problem was that the user was rarely included in models, which was unrealistic.

MR FAIRTHORNE added that what he had referred to in his paper as the 'multitude effect' was a factor and that unforeseen effects of the system upon the user gave rise to long term changes in the system. For example, cameras becoming available to much larger numbers of people had led to loading devices representing a higher percentage of the cost than did the lenses.

MR A. ANDERSON (Heriot-Watt University) said that we should concentrate on really worthwhile research and development, with suitable organizational backing, e.g. by library schools, so that appropriate fields were covered. Large-scale and team research projects, common in academic departments etc., were a valuable innovation in librarianship, though there was a place for the individual researcher too. But there was also a place for those who could only await the result of others' research and try to apply them. We should not all feel that we had to do research. On the other hand, it was a good thing for the librarian to have had some experience of doing research, whether in librarianship or some other subject, since this allowed him to sympathize with the problems of the researcher (his customer) and put him in the position of the user of librarians and so allowed him to understand the user's point of view.

MR LINE said that our first obligation was to our profession; that there was much research potential in librarians and that there were very many problems to be solved. It was no use dumping research teams into situations if we had no clear methodology—this was also a social science and we had the same lack of understanding of how to conduct effective user research. The problem was to steer a course between the extremes of uncontrolled individual research and expensive group research.

MR FAIRTHORNE observed that long term user research was in danger of unsettling the user's normal behaviour and the behaviour of the system, viz. the enormous and unforeseen expansion of the telephone network.

MR J. E. L. FARRADANE (City University) said that research required a research temperament (patience, logical thinking) and research methodology, which must be learned. Some research at basic level is needed to discover 'laws', if possible. Some research must be more developmental, based on the 'laws' already found. But we could not start with the complex situation and hope to obtain widely valid results—the large number of variables of a complex situation would make the result valid only for the particular time and situation. One could not control these variables without sufficient knowledge which was obtained at the more detailed level. The user, and the user's employer, were part of the information system, and must be studied, but not at the same time as trying out some new development or innovation, or at least not until we have studied the existing situation.

MR LINE observed that the difficulty with tackling parts of the problem was that it was not possible to isolate the user's part.

MR A. G. MACKENZIE said that the entire spectrum from large-scale (pure) research through industrial research to development in a single library could not be handled in the same way. We should certainly have centres of excellence with multidisciplinary teams investigating the fundamental problems of libraries and information transfer—these must have outside support from government or elsewhere; we should also have individual libraries carrying out the development work on innovations as they affected themselves—this was part of their everyday work. MR MACKENZIE, however, was concerned about the middle area—the mini-research which could usefully be done at local level, without outside support. Industry spent a certain percentage of its income each year on fundamental research which it must consider worthwhile; libraries ought to do the same, and should devote 1, 2 or 5% (according to size) to work which may not bring any immediate benefit to them, but in the long term was bound to advance our knowledge. So far as he knew only one academic library in this country had had the courage of its convictions in this, instead of merely paying lip-service to the god 'Research'.

MR LINE fully agreed and said that R & D were part of the same continuum and each enriched the other. MR FAIRTHORNE said that it was completely impractical to try to separate the two.

Letter to the Editor

Dear Sir,

IS COPYRIGHT INFRINGEMENT BY NON-PROFIT ORGANIZATIONS ALWAYS PERMISSIBLE?

The quotation in the Brookes' article[1] from the Dainton Report that 'it is legally inadmissible to make a profit on photocopying material in copyright' seems to imply that it is always legal for non-profit organizations to photocopy without the permission of copyright holders. This is undoubtedly a variant on the notion that, in the UK and elsewhere, the financial status of the library automatically determines if the doctrine of 'fair dealing' ('fair use' in the US) can be relied on. For example, Section 7 of the Copyright Act, 1956 and the Copyright (Libraries) Regulations, 1957, permits the making of a single copy of a single article from any one periodical to any person requiring it 'for purposes of research or private study' (and for no other purpose), provided he signs an undertaking to that effect. . . .[2] Exemptions to the authors' or publishers' rights in other nations adhering to the Universal Copyright Convention are more severely limited. Regardless of any limitations on infringement in the current Copyright Regulations, it is certain that many more copies of copyrighted articles are made under conditions that do not adhere to the principles and rules of 'fair dealing' than are made within these boundaries. I believe that the provision of photocopies of US, German and many UK copyrighted journals is an infringement under the Universal Copyright Convention. Eventually even the National Lending Library must face this reality and arrange to pay royalties to publishers for each copy made by NLL. Certain publishers may choose to ignore NLL infringements for various diplomatic reasons. But I doubt that a publisher like Williams & Wilkins, which is presently suing the US National Institutes of Health (National Library of Medicines) for copyright infringement, would feel differently about NLL, the Centre de Documentation du Centre National de la Recherche Scientifique or any other copyright violator, large or small. In each case the publisher or author suffers financial loss. The fundamental issue involved in copyright is not the tax status of the infringer or his agent.

Yours sincerely,

EUGENE GARFIELD
Chairman, Proprietary Rights Committee,
Information Industry Association

G. SOPHAR
Secretary, Committee to Investigate Copyright
Problems Affecting Communication in Science
and Education, Inc.

Institute for Scientific Information,
325, Chestnut Street,
Philadelphia,
Pa. 19106, USA. *10th September 1970*

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CURRENT AWARENESS LIST

Recent additions to the Aslib library catalogue are broken down into twelve broad groups, whose coverage is indicated below. These groups are not mutually exclusive but it is hoped that users will find them helpful in scanning for new items of interest.

Note: These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory.

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres; management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

JANET WALKLEY
Librarian

CURRENT AWARENESS LIST

Items are available in the Aslib library and may be borrowed unless marked to indicate reference copies.*

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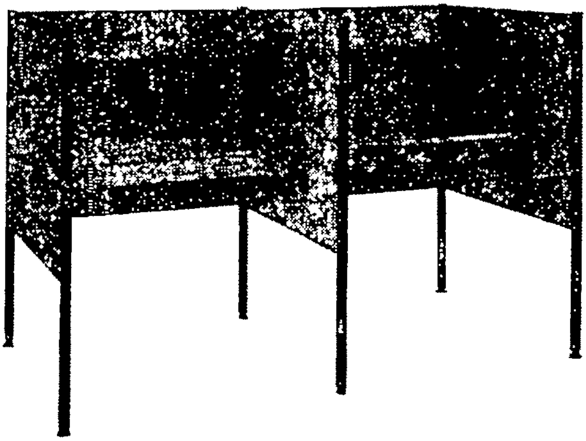

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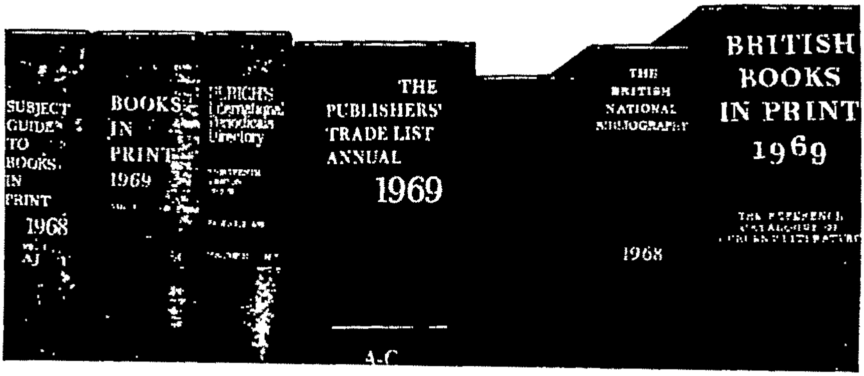
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ASLIB PROCEEDINGS

incorporating Aslib Information

Volume 22 **December 1970** **Number 12**

ASLIB CALENDAR 1971

January

FRI.1–SUN.3.	Social Sciences Group Conference: 'Primary materials in the social sciences'. Loughborough University of Technology.
WED.6.	Chemical Group wine and cheese party and evening lecture: 'Problems of the man–machine interface', by E. D. Wiggins (Fisons Ltd). Aslib. 5 p.m.
MON.11.	Co-ordinate Indexing Group meeting and lecture: 'O & M of feature card systems'. Aslib. 3.30 p.m.
WED.13.	Midlands Branch/Institute of Information Scientists joint evening meeting: 'Locating key articles efficiently', by A. E. Cawkell. Arden Hotel, Birmingham. 6.15 p.m.
WED.20.	Aslib Evening Meeting. 'Library theory and practical vocational training: a forum'. Imperial College, London. 5 for 5.30 p.m.
FRI.22.	Technical Translation Group Annual General Meeting, 3 p.m. Dinner, 7 p.m. Aslib.

February

TUE.16.	Midlands Branch afternoon workshop: 'Innovations in libraries'. Arden Hotel, Birmingham. 2.30 p.m.
WED.17.	Aslib Evening Meeting. 'Systems Research', by Dr Gordon Pask. Imperial College, London. 5 for 5.30 p.m.
FRI.19.	Technical Translation Group meeting and lecture: 'Training translators for International Organizations', by Professor J. Coveney. Aslib. 3 p.m.
THU.25.	Aslib Visit to NRLSI, Bayswater Division, London W2. 4.30 p.m.

March

WED.10.	Engineering Group one-day meeting: 'Metrication for library and information workers'. Aslib. 10.30 a.m.
WED.17.	Aslib Evening Meeting. 'The Scottish Poisons Bureau', by Dr H. Matthew. Imperial College, London. 5 for 5.30 p.m.
MON.22.	Computer Applications Group Circulation Working Party. Repeat of one-day symposium: 'Computer-aided systems'. Aslib.
THU.25.	Midlands Branch Annual General Meeting, sherry and buffet. Engineering and Building Centre, Birmingham. 7 p.m.
MON.29.–WED.31.	Transport Group Course: 'Effective library management'. Missenden Abbey, Bucks.
WED.31.–FRI.2.	Chemical Group Conference: 'Infochem '70s'. University of Surrey, Guildford.

Library theory and practical vocational training: a forum

The Aslib evening meeting on 20th January 1971 will be held as a forum to discuss the theme: 'Library theory and practical vocational training'. Speakers on the panel will be Mr D. J. Foskett, Librarian of the University of London Institute of Education and Chairman of the Education Committee of the Library Association; Professor W. L. Saunders, Director of the University of Sheffield Postgraduate School of Librarianship and Information Science; and Mr B. J. Wilson, Assistant Secretary (Administration) at the Central Electricity Generating Board.

With the help of the audience, the forum will look at a number of problems in the field of library education and training. Mr Wilson, for example, believes that with their emphasis on education for librarianship rather than training for librarians, the schools are not speaking on the same wavelength as employers, particularly industrial employers who bulk the largest numerically. Mr Foskett will give his view of the professional association in establishing standards for entry to the register and in maintaining the relationship between theory and practice in initial training. Professor Saunders believes that the library schools' objectives need to be clearly understood by the employers, if the joint contribution to the education and training process is to be fully effective.

It is hoped that, as a result of discussion of these and other problems, some useful guidelines may emerge on how to increase understanding and co-operation between employers and those training librarians and information officers. The Chairman of the forum will be Mr D. T. Richnell, Goldsmiths' Librarian, University of London.

The meeting will be held at the Imperial College of Science and Technology and will begin at 5.30 p.m. (tea 5.00 p.m.).

Aslib Group on Industrial Training

It has been suggested that with the current emphasis on industrial training a great many people in the Industrial Training Boards and in the industries they serve, to say nothing of those in the broader field of technical education, are faced with serious problems in trying to cope with an ever-increasing flow of information relating to their work and that many would welcome a forum in which they could exchange views and discuss matters of common interest.

Members of Aslib who are interested in such a development should write to the Assistant Director (Services) indicating their field of interest. Librarians and information officers may also wish to bring this note to the attention of their Training Officers or Training Departments.

Commonwealth Agricultural Bureaux to introduce computer-aided processing

The Aslib Research Department has completed a year-long study, sponsored by OSTI, for the Commonwealth Agricultural Bureaux. The aim of the study was to explore the extent to which the thirteen separate centres, which produce eighteen abstracts journals, could be co-ordinated, the extent to which their procedures could be fruitfully aided by computers and the likely costs and benefits of any proposed changes.

The report of the study, written by Harry East, Jane M. Wainwright and B. C. Vickery of the Research Department, was presented to the CAB in February 1970. The findings of the report were considered by the representatives of the Commonwealth countries attending the policy-making quinquennial Review Conference of the CAB held in London in July 1970. Endorsing the major recommendations of the report, the Conference resolved that the CAB should take immediate steps to introduce computer-aided processing, which would bring the following benefits:

(a) speedier journal production;
(b) provision of subject indexes in individual journal parts;
(c) facility for searching the whole CAB information store in order to provide special services, e.g. current awareness publications, SDI, annotated bibliographies, and special publications which cut across the existing abstracts journal divisions (e.g. wheat abstracts, manganese abstracts);
(d) availability of information recorded on magnetic tape;
(e) availability of CAB information in a form interchangeable with the world's other major information services;
(f) progressive release of scientific information staff from routine clerical duties for more appropriate work and to cope with the increasing volume of literature;
(g) reduction of duplication of abstracts production within the CAB.

The Conference approved the expenditure of the development costs and the increased running costs. The CAB is now recruiting the technical staff necessary for these developments.

FID International Congress

The 35th International Congress of FID, held in Buenos Aires from 21st to 24th September, was attended by approximately 600 delegates from some 30 countries. The theme of the Congress was 'Users of documentation', comprising sessions on: communicating information to users; training of users; and tools for users.

Delegates from the UK included Mr Felix Liebesny (Chairman of Council and the official representative of Aslib), Mr M. Hill (NRLSI), Dr K. Needham, Mr H. Schur (Sheffield University) and Mr D. N. Wood (NLL).

41 papers were presented at the Congress, including a paper by Dr Wood on the training of scientists and technologists in handling information. Papers were also presented by Dr Needham, who spoke to a meeting of FID/LD (Linguistics in Documentation), by Mr Schur, who spoke on library and information systems analysis and design at a meeting of FID/TM (Theory of machine techniques and systems), and by Dr D. J. Urquhart (presented by Dr Wood) on interlibrary services in the UK, at the Regional Conference held on 21st–22nd September.

The volume containing the papers presented at the Congress (approx. 570 pp.) is available as FID publication 472 from: Consejo Nacional de Investigaciones Científicas y Técnicas, Rivadavia 1917, Buenos Aires, Argentina; or from FID, 7 Hofweg, The Hague, Netherlands (price $5).

The City University: Centre for Information Science

The M.Sc. and Diploma courses, and research, in Information Science at the City University are now organized in a separate unit of the University, named the Centre for Information Science. This is located at Lionel Denny House, 23 Goswell Road, London EC1. Mr J. Farradane is Director of the Centre.

Two further lectureships have been created at the Centre: a first appointment is Miss B. Smolny, B.Sc., M.Sc. (Inf.Sc.), M.I.Inf.Sc.; a second (from January 1971) is Miss P. A. Yates-Mercer, B.Sc. (Phys.), M.Sc. (Inf.Sc.). The number of places on the courses has been increased to thirty students in each year.

Advisory Committee for Scientific and Technical Information

The Secretary of State for Education and Science has appointed the following to the Advisory Committee for Scientific and Technical Information: Mr H. J. Habakkuk, Principal of Jesus College, University of Oxford; Professor J. B. Jepson, Courtauld Institute of Biochemistry, Middlesex Hospital Medical School, University of London; and Mr D. T. Richnell, Goldsmiths' Librarian, University of London. These appointments took effect on 1st October 1970.

Non-book materials and libraries

OSTI has awarded a grant of up to £14,860 for three years to the University of Sussex to study the impact of 'new media' on libraries. The project is under the direction of Dr B. J. Enright, University Librarian.

This library has had an interest in non-book materials for some time and in August 1969 the University Media Services Unit was amalgamated with it. The purpose of the project is to develop procedures for selecting, acquiring, organizing and making available multi-media materials held in a traditional library, and at the same time to observe the effect of such procedures on existing practice.

The project will also include a 'state of the art' survey of multi-media libraries in the United Kingdom and other countries, together with studies of the involvement of multi-media libraries in the educational process.

The project will bring together existing knowledge and expertise in the handling and use of non-book materials, apply it to the University Library, and develop improved techniques for multi-media library administration. Further details can be obtained from Dr Enright at the University Library, Falmer, Brighton.

UK/USSR working party on information

Under the UK/USSR Technological Agreement signed in January 1968, a working party on storage and retrieval of scientific and technical information has been set up and held its first meeting in Moscow in March this year. The USSR delegation consisted of representatives of the State Commission on Science and Technology and VINITI; the UK delegation represented the Ministry of Technology, OSTI and the Institution of Electrical Engineers, and was led by Mr C. G. Giles.

At the meeting four areas were identified for further exploration and possible co-operation by specialist groups: the INSPEC system; chemical information systems; mechanization of library procedures; and research on information retrieval. The INSPEC group and the information retrieval research group have already held meetings in Moscow; and the other two groups recently met in Britain. The recommendations of the groups will be considered by a working party at its second meeting, scheduled for early 1971.

Analytical techniques for library management

The Ealing School of Librarianship is offering a short course of evening lectures on 'Analytical techniques for library management'. Intended for practising librarians in any kind of library, they will introduce statistical and other methods but they will not expect very much mathematical skill. Encouragement towards a deeper understanding will be given by way of hand-outs and recommended reading.

The Course will last from January to March 1971, and will take place on successive Wednesdays from 7 to 9 p.m. For further information please write to: Mr J. Burkett, School of Librarianship, Ealing Technical College, St Mary's Road, London W5.

BACIE Training Aids Index

The British Association for Commercial and Industrial Education has announced a new trade literature service, the *BACIE Training Aids Index*. It will cover all audio-visual aids and other educational equipment ranging from chalkboards to television, videotape and simulators. Subscribers will receive publicity material used by the manufactures in a binder, and this will be supplemented by new material at regular intervals. The index will probably be revised and updated twice a year. Members of BACIE can receive this service for a registration fee of £2 plus an annual service charge of £1. The charge to non-members will be £3 plus an annual subscription of £3. Enquiries should be addressed to the Information Department, BACIE, 16 Park Crescent, London WIN 4AP.

Technical and scientific Japanese reading

As announced in the December 1969 issue of the *Proceedings*, Professor G. Bownas of the Centre of Japanese Studies, University of Sheffield, is currently undertaking an OSTI-supported research project on the development of an intensive course in technical and scientific Japanese reading.

The first year of research concentrated on the preparation of the first Pilot Course held from 8th June to 31st July 1970. Assessments of various characteristics of the course have shown that it is possible to teach the ability to comprehend, and translate into English, Japanese technical and scientific texts in an intensive course lasting eight weeks. Participants on the first course were recruited from companies, libraries and research institutions which responded to early press releases.

A further Pilot Course, which will benefit from modifications and improvements made as a result of the first course, will be taught in Summer 1971. Up to twenty participants will be accepted and the course will take place for eight weeks, beginning probably on 5th June. Further information and application forms can be obtained from Dr J. Jelinek, Centre of Japanese Studies, The University, Sheffield, S10 2TN.

The Powder Advisory Centre

The Powder Advisory Centre, an international information and consultancy agency concerned with particulate and bulk granular solid materials, was founded just over a year ago and offers a number of services to industry on an annual subscription basis. The Centre's activities include the publication of a quarterly journal/information bulletin, *Particulate Matter*, containing review articles, literature abstracts, news of meetings, book reviews etc. The Centre also engages in a wide variety of library and bibliographical services, as well as organizing major conferences, lecture courses and seminars on the subject of powder technology. Subscribers are also offered literature searches, published bibliographies and a consultancy service.

Annual subscription to these services is £15. Further details from the PAC's Director, A. S. Goldberg, at: Powder Advisory Centre, 1 Eldon Square, Newcastle upon Tyne, NE1 7JG. (Tel. 0632–22578/9).

International Conference on Information Science: change of dates

This conference, organized by the Israel Society of Special Libraries and Information Centres (ISLIC), will now take place on 30th August–3rd September 1971, not 22nd–27th August as previously announced in the August 1970 issue of the *Proceedings*. This issue gives details of the subject areas to be covered at the conference, but those requiring further information should contact: Conference Secretary, ISLIC, POB 16271, Tel-Aviv, Israel.

Encyclopedia of Library and Information Science

Volume 3 of the *Encyclopedia of Library and Information Science* has recently been published by Marcel Dekker of New York. It is edited by Allen Kent and Harold Lancour and covers subjects from 'Bookmobiles' to 'California'. The price is $45.00.

Conference of Librarians from Commonwealth Universities in Africa

With the aid of a grant from The Commonwealth Foundation, librarians from the universities of Commonwealth African countries met in Lusaka in August 1969 for a discussion of their common problems. Present at the four-day conference were university librarians from Ghana, Nigeria, Tanzania, Uganda, Kenya, Malawi, Zambia and Lesotho, together with invited participants from Britain, USA, Senegal and Ethiopia.

A report of the Proceedings of the conference has recently been published by The Commonwealth Foundation as Number VIII in their 'Occasional Paper' series. It is obtainable free of charge from The Commonwealth Foundation, Marlborough House, Pall Mall, London SW1.

Presentation of serial publications

The British Standards Institution has recently revised BS 2509, *The presentation of serial publications, including periodicals*. This standard originally dealt with the form and presentation of periodicals of reference value only, but it now applies to all types of serial publication, though some, such as newspapers, are excluded from the full provisions of the standard.

The standard describes principles which apply to the information to be shown on the title page, the form of title to be selected, the numbering and dating of issues and volumes, the provision of tables of contents and indexes, the identification and presentation of articles, and pagination and format.

Copies of BS 2509:1970 are obtainable from BSI Sales Branch, 101/113 Pentonville Road, London N1 9ND, price 12*s* (subscribers 10*s*).

UDC: English Full Edition

Two new volumes of the UDC have recently been published by BSI: BS 1000 (332) *Money, banking and finance* covers the concepts of banks and banking, including savings banks, funds and other loan institutions; money and types of currency, including money substitutes; exchange and the money market; credit and types of interest.

BS 1000 (674) *Timber and wood working industry* provides a systematic schedule for the classification of matter pertaining to the processing of timber and wood in industrial and craft undertakings, and of comprehensive works concerning the production of wooden objects.

Both volumes are obtainable from the BSI Sales Branch, 101/113 Pentonville Road, London N1 9ND, price 24*s* and 34*s* respectively (subscribers 20*s* and 30*s*).

BRIEF REVIEWS

GLOSSARY OF INTERNATIONAL TREATIES in French, English, Spanish, Italian, Dutch, German and Russian. Compiled and arranged by Yvette Renoux with the collaboration of Janine Yates. Amsterdam, London, New York, Elsevier, 1970. 198 p. 115*s*. (SBN 444 40813 4).

This manual of significant terms used in international treaties since the turn of the century is sponsored jointly by the Universities of Geneva, Georgetown (Washington DC), Heidelberg, Mainz, Paris, and Trieste, and is a new title in the series *Glossaria Interpretum*, multilingual tests of terminology in various specialized fields. The terms in the present volume are drawn from three sources: (a) authentic texts of international treaties and other international instruments; (b) their official translations by the Governments concerned for presentation to their own legislatures; or (c) the translation approved by the organizing Secretariat of the Convention concerned. (An asterisk precedes entries taken from (b) or (c)). The languages chosen are the official languages of the UN, excluding Chinese. No attempt has been made to edit or amend the archaisms, errors or variants. Basic arrangement is by French term, each full entry being preceded by a code indicating the document source. (The code is explained in the Notes at the beginning of the book.) There is a separate index of terms in each language with a reference to their location in the main body of the text.

MEETING OF THE STUDY COMMITTEE OF INTERNATIONAL FEDERATION FOR DOCUMENTATION 'RESEARCH ON THE THEORETICAL BASIS OF INFORMATION', Moscow, 24–26 February 1970. Proceedings. Moscow, All-Union Institute for Scientific and Technical Information, 1970.

The eight reports given at the meeting are published in this volume in their language of presentation (English or Russian), together with summaries in the alternate language. They emphasize the need for solutions to practical problems confronting scientific information activities, and to problems of basic research such as language barriers, international indexing systems, the size of information collections, meeting the information needs of industry. The reports also consider the role of the FID in basic and applied research in information theory and its possible contribution to the development of the World System of Scientific and Technical Information.

MUKHERJEE, A. K. Fundamentals of special librarianship and documentation. Calcutta, IASLIC, 1969. 276 p. (IASLIC Manual No. 1). Rs 35.

As there are now more than a thousand special libraries in India, the author, a distinguished Indian librarian, aims in this manual to meet 'the need for a book dealing with the fundamentals . . ., accessible to Indian readers'. Using the standard texts (mainly English language) the author discusses the functions of these libraries and documentation centres and covers the wide range of problems involved in the acquisition, organization and dissemination of documents and information. There are also a number of chapters dealing with the professional and philosophical implications of librarianship in relation to scholarship and science.

The volume is sponsored by the Indian Association of Special Libraries and Information Centres, the Indian equivalent to Aslib.

INFORMATION SCIENCE: DISCIPLINE OR DISAPPEARANCE

WILLIAM GOFFMAN

Director, Centre for Documentation and Communication Research
School of Library Science, Case Western Reserve University

Paper presented at the 44th Aslib Annual Conference, University of Aberdeen, 20th–23rd September 1970

IT IS NOW some twenty years since the activity which has come to be known as information science had its discernible origin as one of the so-called new interdisciplinary fields that emerged in the post-war proliferation of scientific activity. This scientific revolution which also produced such new fields as operations research, game theory, systems engineering, cybernetics and so forth can for the most part be traced to the war itself in that they were attempts to develop general methods for dealing with problem areas, the likes of which were encountered during the conduct of the war. The origins of information science, for example, can be directly traced to the war during which the efficient and knowledgeable handling of masses of information was necessary. Because these tasks were generally assigned to undermanned staffs, it was natural for people to believe that the solution to problems relating to information processing lay in the supply of necessary manpower to carry out a sequence of clerical tasks. With the immediate post-war proliferation of scientific publications which in no small degree resulted from the demonstration of the value of science in the war and hence the ensuing formation of new areas of activity, it was no wonder that scientists began to feel that (1) an information explosion was taking place and (2) critical communication problems were arising in the scientific community due to this information explosion.

Simultaneous with this development was the fact that digital computing machines were becoming accessible to the scientific community. Consequently, based on wartime experiences, it was believed that solutions to problems created by the information explosion were obtainable by replacing large staffs of human processors by computing machines which could carry out the needed clerical tasks more accurately and more efficiently. It soon became evident, however, that there was something wrong because, although it is indisputable that computing machines can in fact perform clerical tasks very rapidly and accurately, solutions were not forthcoming. Some blamed this on the computing machines themselves; they weren't big enough or fast enough. Others came up with get rich schemes: it's all a coding problem; it's only a problem in linguistics or mathematics or logic or indexing and so forth. Thus, this activity which came to be called at various times, without differentiation, documentation, information retrieval, information sciences and finally information science, passed through a parade of clever schemes each of which was proclaimed by its inventor as the answer to the problem. Little progress was made because first of all it was not known whether a physical problem did in fact exist and if so what was the nature of this problem.

Meanwhile, the feverish activity, spawned by large government grants, particularly in the United States, continued. Professional societies were formed and a hierarchy of elder statesmen developed. Although much was contributed to the literature proliferation as if to demonstrate that an information explosion did indeed exist, there was little of importance or lasting interest produced. What was produced was a diffuse body of literature whose members showed little, if any, relation to each other.

Nevertheless, there soon began to appear on the scene an endless stream of curricula and the establishment of a discipline was proclaimed. At first such curricula were most likely to be found in schools of library science since it was said that the library as the institution most concerned with information is the place where the revolution in information processing and handling should become manifest. However, inroads of information science into the library curricula were short lived, mainly for two reasons. First, library schools were more concerned with training traditional librarians for which there was a great demand and second, they rightly were not ready to accept areas of activity whose relevance to them was not clear. However, library science itself was much in the same position as information science in that it has not yet adequately defined for itself a set of principles which distinguish it as a discipline among the others in the academic community. If a discipline is defined by its problems, and to my knowledge the problems of library science have yet to be defined, then library science itself has yet to emerge as a discipline. Hence, in recent years library science has turned back to information science as a means of obtaining the academic respectability which it lacks. But, a scientific discipline cannot be wedded to any specific institution such as the library which by its very nature is so restrictive as to preclude the possibility of the formation of the very principles upon which a discipline must rest.

It is for this reason that the recent new and even more restrictive association of information science with computing machines is also doomed from the start. Not unlike the librarians, the computing people in seeking academic respectability had established curricula which they similarly called computing science. They also have not been able to define the problem areas of their activity. Hence, we see the bizarre situation of two physical facilities vying for academic respectability by capturing a name (information science) which represents as elusive an intellectual content as they do. It is doubly amusing since in a sense libraries and computing machines are equivalent, i.e., one can think of a computing machine as a special highly restrictive type of library in that its functions, namely the acquisition, organization and dissemination of information, are identical with those of a library. Hence the competition over information science. Clearly, the development of a genuine discipline which can be called information science could be highly beneficial both for libraries and computing machines. But, by its very nature, such a discipline cannot be strictly associated with either as it will become strangled by the rigid restrictions imposed on it by its area of application. Thus, information science must transcend libraries and computing machines and must develop its principles independent of these or any other physical system involving the notion of information while at the same time being applicable to all of them. That is, we must begin seriously to question the foundations of the entire area of activity now called information science.

The aim of a discipline of information science must be that of establishing a unified scientific approach to the study of the various phenomena involving the notion of information whether such phenomena are found in biological processes, human existence or the machines created by human beings. Consequently, the subject must be concerned with the establishment of a set of fundamental principles governing the behavior of all communication processes and their associated information systems.

It is very important to distinguish between processes and systems for much confusion may result by failure to do so. In general, a process is a time dependent phenomenon, i.e., a sequence of actions leading to some result. A communication process is thus a sequence of events resulting in the transmission of information from one object to another. The first object is called the source and the latter the destination. A system, on the other hand, is the mechanism by means of which a process is realized. More precisely, a system is a collection of elements interacting to perform a specific function for a specific purpose.

Systems whose functions are the carrying out of communication processes are known as information systems. Such a system will take the information at the source and operate on it in some way to produce a signal suitable for transmission on some channel to a receiver at the destination. With every communication process there is associated a set of information systems, namely those systems capable of carrying out the particular process. Such systems need not be unique since a given process may be realized by a variety of mechanisms. The notion of designing and building systems for the purpose of carrying out unknown processes does not seem to be a sound basis on which to erect a field of scientific inquiry. It is evident that the failure of large scale automatic information systems to a great degree is due to a lack of understanding of the processes which such systems are supposed to carry out. Thus, a primary task of information science is the study of the properties of communication processes which may then be translated into the design of the appropriate information system for a given physical situation. Hence, a host of new problem areas directed towards the establishment of the fundamental principles governing the behaviour of all communication processes must be opened up.

The major difficulty in any scientific treatment of communication processes arises from the fact that the concept of information, although intuitively understood, can neither be formally defined nor precisely measured. However, when considering processes whose outcomes are governed by the transmission of information, the information transmitted can be evaluated in terms of these outcomes. Hence, the study of communication processes and information systems may be approached in this way.

There seem to be three broad problem areas relating to the outcome of a communication process. These are:

1. The *behavioural problem* which deals with the success with which information

conveyed from a source to a destination effects the desired outcome at the destination.

2. The *representation problem* which is concerned with all aspects of representing information to be conveyed so that it will be correctly understood at the destination.
3. The *technical problem* which is concerned with the accuracy of transmitting the information from the source to the destination.

Clearly, these three problem areas are not independent of each other because the question of behaviour depends to some degree on the other two. It would seem, however, that the representation and technical problems relate more directly to information systems, i.e., to the realization of communication processes rather than to such processes themselves. The mathematical theory of communication as developed by Claude Shannon and others[1] deals chiefly with the technical problem and, although very profound, is thereby limited. It is of little value, therefore, in approaching the problems of communication from a general point of view. That is, the Shannon theory is of little value in the development of a discipline of information science.

The fundamental notion underlying the behavioural problem in communication is the notion of effective contact between the information source and the destination. For example, effective contact is clearly the governing factor in the outcomes of the two most familiar communication processes, namely the transmission of knowledge and the transmission of disease. It is thus not surprising to find a striking parallel between these two processes. An excellent detailed discussion of this analogy can be found in Siegfried.[2] In the case of disease we are dealing with infectious material which can be transported and transmitted, whereas in the case of knowledge we are dealing with the transport and transmission of ideas, benevolent or malevolent, depending on one's point of view. In either case, for diffusion to take place, there must be an individual who puts forth the infectious material or idea, a carrier who transfers it and receptive surroundings. The extent of diffusion in both instances is then a matter of effective contact between the agents transmitting the infectious material or ideas and those individuals coming in contact with them. The human being, in the case of ideas, is the propagating agent either by word of mouth or through the medium of books, articles, pamphlets and so forth, just as he causes the spread of germs either by direct contact or through intermediate hosts. Ideas, moreover, are propagated along the same routes as germs, namely the world's transportation routes. The routes of ancient caravans, for example, which provided the instrument of communication were also the routes travelled by disease. Furthermore, the vocabulary which normally comes to mind when talking about the spread of ideas is that of medicine. One often hears such expressions as 'that's a contagious idea' or 'he's not too susceptible to that idea' and so forth.

Just as society fights against the invasion of disease, so it defends itself against subversive ideas. Its most decisive action is to destroy the infectious material or idea at its source. This is often difficult since, in both cases, one does not always know exactly where to find it. Another defence consists of suppressing the carrier or at least preventing him from entering the territory one wishes to preserve. The most prudent procedure is to take preventive measures. Censorship, police supervision and religious persecution are all examples of this approach. In the defence measures that human societies adopt against the attacks and penetrations of new ideas, mechanisms similar to immunization and vaccination likewise exist. A given reform, subtly inspired by the menace itself, will often prevent the new ideas from spreading when they appear locally. A healthy society has its own defences against such infections which might endanger the integrity of its personality. On the other hand, an unhealthy society will catch all of the illnesses. Rome, for example, was not able in its decline to defend itself against Christianity.

As an example of the spread of ideas in the intellectual world, consider the development of psychoanalysis in the early part of this century. Freud was no less host to the infectious material of the disease psychoanalysis than the person carrying the organism capable of transmitting a cold, nor are his writings less an intermediate host carrying infectious material than is the mosquito a carrier of the agent of malaria. Moreover, Abraham, Ferenczi, Jung and Jones were no less infected by the ideas of Freud than are those individuals infected by the agent transmitted by the cold carrier. After a certain period of time, i.e., a latency period, Freud's disciples were themselves in a position to transmit infectious material to others. Jung might represent an example of acquired immunity to the disease whereas the resistance of the medical community of Vienna might represent innate immunity. The development of the psychoanalytic movement in the early part of the twentieth century was in its way no less an epidemic than was the outbreak of influenza in 1917 and 1918. It was not surprising that the psychoanalytic epidemics took place in Protestant countries which provided more receptive surroundings for the infectious material, i.e., Freud's ideas, than the Roman Catholic countries. Psychoanalysis is an example of an intellectual epidemic instigated by an individual. Such epidemics are not unusual in the world of scientific thought. One may cite many other well-known occurrences, e.g., Darwin and evolution, Newton and mechanics, Cantor and set theory, Boole and symbolic logic and so forth.

It is thus apparent that the process of transmitting infectious diseases and the process of transmitting knowledge have many common characteristics. In fact, the primitive notions of knowledge, information and ideas stand in the same relation to each other in the one case as do the primitive notions of disease, agent and infectious material in the other. In the transmission of knowledge the idea plays the role of the infectious material; information corresponds to the agent by means of which the infectious material is transmitted and the interaction between an individual and an idea may or may not result in the acquisition of knowledge, just as the interaction between an individual and infectious material may or may not result in a case of disease.

Because the principles underlying the spread of infectious diseases also govern the diffusion of information and the spread of knowledge, a communication process can be represented as an epidemic process. Consequently, epidemic processes can be used as models to develop understanding of communication processes. That is, we can replace the study of communication processes of which little is known by the study of epidemic processes for which a theory exists and which has certain important characteristics in common with the subject under investigation. For an example of the application of epidemic theory to the transmission of ideas see Goffman.[3]

The above discussion is but a crude example of the sort of activity required before we can begin to think of a discipline of information science. As a further illustration, consider the various schemes which saw the light under the guise of information science called statistical association techniques for information retrieval.[4] Underlying all of these schemes was the assumption that the notion of nearness of information as represented by documents exists and is measurable. Thus, the literature abounds with such phrases as 'index space', 'vector' and so forth whereas there has been no demonstration that such things exist relative to the concept of information. A general theory on this topic could not only produce each of these schemes as realizable examples but should have application to situations involving communication processes other than recorded discourse, e.g., neural networks and the transmission of disease. Thus each special case could act as a model for the others and knowledge about each process may be gained which otherwise may be unobservable. I would like to show a simple example of how such a general theory might be constructed.

Consider a literature L and the set of authors A who have contributed to L. Let A_{00} represent an author in A selected at random. Furthermore, let A_{11}, $A_{12}, \ldots, A_{1_n}$, be the set of all authors in A who have co-authored articles in L with A_{00}; $A_{21}, A_{22}, \ldots, A_{2_m}$ the set of all authors in A who have co-authored articles in L with the A_{1_i} authors, $i = 1, 2, \ldots, n$; $A_{31}, A_{32}, \ldots, A_{3_k}$, the set of all authors in A who have collaborated with the A_{2_j} authors, $j = 1, 2, \ldots, m$, in producing publications in L and so forth. Continue this process until there are no authors remaining in A who have collaborated in producing a publication in L with any of the A_{ij}, $i, j = 0, 1, 2, \ldots$, and denote this set by C_1. By repeating this procedure on the remaining set of authors we obtain a partition of A into disjoint classes of authors having the property that for any two authors belonging to a given class there exists a chain of co-authorships connecting them. It is moreover easy to show that the shortest chain connecting two members of a given class defines a metric on the set of authors belonging to that class.

Let us now consider a set of information conveying objects. Suppose that there is a conditional relevance measure defined on this set, i.e., a measure which states the relevance of an object x_j relative to an object x_i, x_i and x_j both being members of X. In the case of co-authorships the conditional relevance measure can be only zero or one, depending on whether or not two individuals have collaborated on a publication. In general, however, we must assume that a conditional relevance measure between two information conveying objects can take on an infinite number of values. Hence, for convenience, it is customary to take the conditional relevance measure to be a conditional probability. If we assume the existence of a critical probability, i.e., a threshold condition which differentiates between the barely relevant and the not quite relevant, then given any collection of information conveying objects, a partition of this collection into disjoint classes similar to the partitioning of co-authors can be effected whereby a bona-fide distance function can be defined on the members of each class. In this way it may be possible to talk about the nearness of information. If the information conveying objects are taken to be documents then each of the so-called statistical association techniques could be used to obtain estimates of the conditional relevance measures between the documents of a given collection. If, on the other hand, the information conveying objects are interpreted as neurons then the conditional relevance measures between neurons are the conditional probabilities that given neurons will fire on the condition that other neurons have fired. The resulting structure turns out to be a reasonably good model of neural networks, in some ways superior to the classic McCulloch–Pitts model. Finally, if we interpret the information conveying objects as symptoms and signs of disease states, then each chain might represent a possible syndrome and we have a model for diagnosis which seems to be far more realistic than the Bayesian models which have heretofore been proposed.

In summary, it is this type of activity, and only this type of activity, which can lead to the formation of a legitimate discipline of information science. If such activity is not forthcoming in the near future, in great abundance, then information science is destined to become extinct in the evolutionary process of scientific thought.

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3 GOFFMAN, W. Mathematical approach to the spread of scientific ideas. *Nature*, **212**, 1966, p. 449–52.

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DISCUSSION

MR A. E. CAWKELL (Institute for Scientific Information) asked what effect the trend towards multiple authorship had on co-author networks. Presumably there would be significant differences between, say, a nineteenth-century article network (average number of authors per article about 1.3), and a current article network (average number of authors per article probably 2.8). PROFESSOR GOFFMAN replied that he had taken co-author networks as a simple example to illustrate the method. One of his students had worked out such a network based on the *Science Citation Index*, and a physical model had been made, but he had forgotten what the conclusion was.

MR R. G. WYNNE (British Titan Products Ltd) asked Professor Goffman whether, in research on information processing, it was an advantage or disadvantage to understand the information being processed. In other words should the research team consist of those with knowledge of the subjects in the subject fields being studied as well as the information scientists. PROFESSOR GOFFMAN replied that, in his opinion, this was not necessary.

MR R. A. FAITHORNE (Independent) suggested that when talking about 'knowledge' one should be very careful to distinguish between knowledge and how it was talked about. The first was what made the practitioner of the activity expert in his job; to do it one must know *why* things were spoken of in a certain way by certain people. The second was 'book knowledge', demanding knowledge of *how* these things were spoken of and by whom to whom. PROFESSOR GOFFMAN had been careful to use 'information' in the sense of 'messages'. He distinguished it from 'knowledge', owned by author or reader, and from 'signals', the representations of those messages.

MR CAWKELL suggested that an area of research fully justifying the label 'information science' was the possible application of information theory (stemming from Shannon, 1948) to information content. In the early 1950s, Shannon's work, clearly explained as being concerned with the correct receipt of symbols without regard to meaning, was misapplied in several areas of science. More recently such misapplications had continued, but it had received proper consideration, as applied to meaning, by Bar-Hillel, Carnap, McKay and others. McKay had suggested (*Information, mechanization and meaning*, MIT 1969) that further work awaited a better understanding of the 'human conditional probability matrix', whilst Longuet Higgins, in a recent article ('The monkey's paw', *New Scientist*, Sept. 3, 1970) had wanted nothing to do with the application of computers to the understanding of human language. Certainly any research which held out the hope of a better understanding of human information processing would be well worth undertaking. PROFESSOR GOFFMAN replied that there was a close relationship between a signal and the resulting human behaviour but he did not know what it was.

METHODOLOGY IN RESEARCH

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RESEARCH IN library and information service I take to be any systematic attempt to investigate problems and arrive at solutions. The problems can be small-scale, e.g. the best way to file pamphlets; or large-scale, e.g. the optimum distribution of reference libraries throughout the country. They can be specific to one institution, e.g. the best method of providing current awareness to Members of Parliament; or of general import, e.g. the economics of microfilming. They can be short-term, e.g. a brief study and recommendations concerning a specific indexing job; or long-term, e.g. a continually deepening exploration of the functions and structures of bibliographic records in all kinds of library situations. They can be very practical, e.g. redesigning the layout of a library; or very theoretical, e.g. developing a linear programming model for resource allocation.

From time to time, every librarian or information officer faces problems in his or her own institution, and feels the need to investigate them. Often, he or she does so, using whatever local talent is available. Increasingly, the Aslib Research Department is being invited into such situations, either to give advice or to take part in an investigation as a consultant. Beyond this, Aslib carries out background investigations into problems of wider import.

Research has several phases: identifying a problem to study, determining how to investigate it, collecting data and analysing it, and deciding how to apply the results in operating libraries and information centres. A piece of research may be fruitless because of a weakness in any phase. The problem may be trivial, or even unreal—for example, one might elaborately study how to check and correct all errors in some clerical procedure, when the cost of the checking would far exceed the costs incurred by the errors. The method of investigation may be inadequate—for example, statistical conclusions may be worthless because of a hopelessly biased sampling procedure. The data may just not be obtainable, or available only in a form that defies analysis. The results may be impossible to apply, because they relate to factors outside the library's control or resources.

Data to aid decision

My theme here is methodology. There is no single research method. At bottom, research is the study of problems with no holds barred, using any technique that imagination can devise. A number of standard methods are available, mostly developed in other areas of study and now being applied in the information field (Figure 1). Rather than trying to present a 'state-of-the-art' account of each method, I think it will be more useful to consider the kinds of problem that occur in the management of libraries and information centres, the kinds of data needed to solve each problem, and the extent of our understanding as to how to obtain these data.

FIGURE 1: *Some analytical techniques for investigating libraries*

1. *Users, customers*
   Observation of behaviour
     (a) direct
     (b) indirect, via records of behaviour
       (i) self-compiled (citations, diaries, questionnaires)
       (ii) compiled during system operation

   Collection of opinions, statements of wants
   Analysis of needs
   Interaction with system
     Measures of effectiveness (all kinds)
     Queueing theory

2. *Processes*
   Work and method study (including work simplification and procedure study)
   Value analysis
   Network analysis

3. *Operators*
   Work measurement
   Activity sampling
   Motion study
   Performance analysis
   Job study
   Organization theory

4. *Equipment and accommodation*
   Replacement analysis
   Layout analysis
   Ergonomic analysis

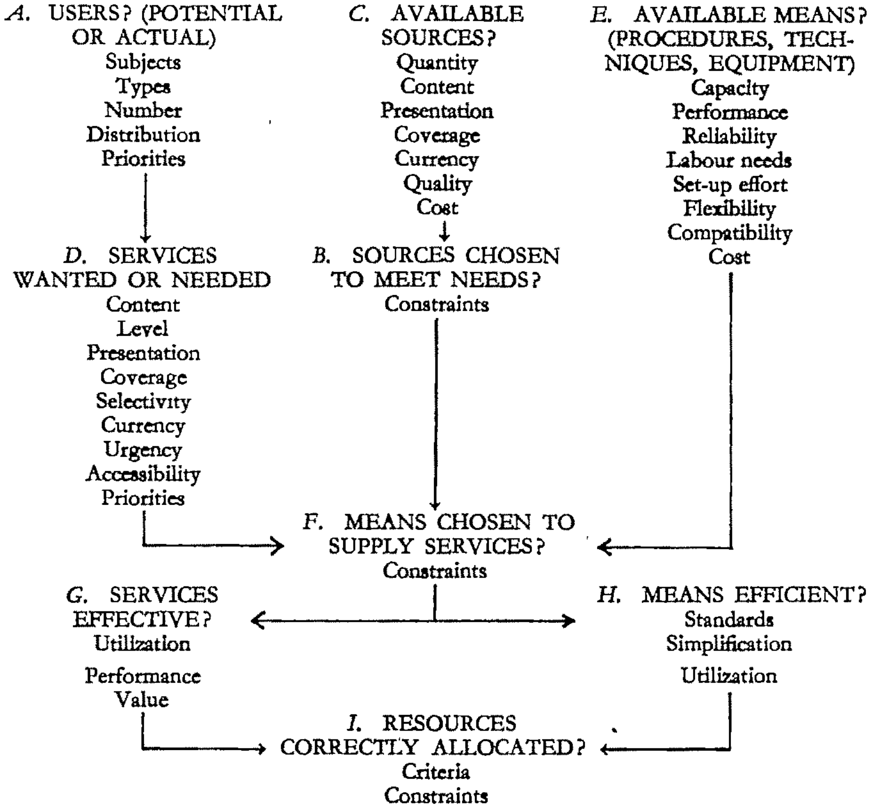
5. *Documents, records, collections, files*
   Statistical bibliography
   Forms design
   Store and file organization
   Code design

6. *General*
   Statistical methods
   Sampling
   Charting and graphical methods
   Quality control
   Resource allocation
   Simulation
   Standardization
   Data processing

In Figure 2 are suggested some of the main decisions that face those who set up and operate a library or information centre: who are or will be the users? what are their wants or needs? what information sources are available? which of these will be used to meet needs? what means are there to provide services? which of these will be used? are the resulting services effective? are the means efficient? are total resources being allocated to the best effect?

Against each query are listed some of the factors about which data are needed if the question is to be answered. For example, about wanted or needed services we should know their subject content, level of exposition (theoretical or practical, academic or popular?), mode of presentation (full text or summary, rough and ready or elegant?), coverage (all available information or a sampling?), selectivity (a broad subject spread or information tailored to each individual?), currency (how up-to-date?), urgency (how quickly should the service respond?), accessibility (should information be at each user's elbow or in a central store?), and priorities (which service is most important?).

FIGURE 2 *Some decisions in Library management*



Users, their wants and needs

How does the librarian identify his users? The question may sound absurd: if a library is set up for a research department or establishment, surely the users are prescribed. Are they? Do we regard as users (actual or potential) only those who take the trouble to walk through the library door? Are some who might benefit from information (e.g. laboratory assistants) barred by restriction, tradition or even shyness from using the library? Are the needs of each user group equally well known? Suppose that one's users are nation-wide (say, members of a professional society) or even world-wide (subscribers to an international information service)—how much does one know of them?

There are two approaches to obtaining data about users. One is to study their expressed wants, in some kind of survey.[1] This is a well-developed method of investigation, so well-developed, in fact, that one sometimes gets the impression that it is *the* Method. I wish only to remind you of some of its difficulties.

I have already referred to the problem of defining what is the population of users. Who, for example, are the users of information about metals? In an Aslib investigation[2] we decided that the best we could do was to throw out a series of trawls, hoping to catch a number of users within each net: members of metals institutions, users of libraries, people approaching industrial liaison officers. Since the outcome was not a randomly chosen sample from a well-defined population, what was its status? It was not truly representative of a set of users: we chose to regard it as an imperfect representation of 'those who were actively interested in metals information'.

The techniques of survey are indeed well established. The difficulties are in achieving the control necessary to derive statistically significant results, and in accepting user opinion as a sufficiently informed expression of real needs. To get beyond opinion, recent user surveys have asked users to describe actual instances of their actions, say, the most recent search for information. This technique of 'specific incidents' is believed to give a picture nearer to real needs. It can be amplified into extensive case histories—say, diaries kept by individual information users over a period of months. The results often give fascinating insight into the incoherence of much information search, but are difficult to generalize to a whole population of users.

These types of survey shade into an analysis of needs. One example of this is the study reported to the 1968 Aslib conference by T. J. Allen.[3] The work of a project laboratory is followed step by step, and the information contributing to each development is identified, together with its source. In this way, the mechanics of information flow into and within a user group are elucidated. On a wider scale, the information needed at each stage of product development can be identified by analysis of the work involved.[4]

Such surveys of need are much less developed than traditional user surveys. They carry the interesting implication of the educational role of the information service—identifying and meeting needs that may not be clearly expressed by users. They require that the investigator should penetrate behind the information demand as it is presented at the library counter, and explore the work situation that gives rise to information need. Equally, he can try to assess the effect on that work situation of meeting the need.

Information sources and means

Knowing users and their needs, the next step is to identify the information sources (documentary and otherwise) that may be drawn upon to meet the needs, and to decide which will in fact be used.

A knowledge of information sources is one of the necessary skills of a librarian, and continually to extend it is a matter not of research but of his professional growth. Still, no one is omniscient, and to explore the bibliography of a subject, and make the results available to others, has long been regarded as useful library research.

To determine the quantity of books, journals, reports, etc. available in fields of interest to a user group; the content, presentation, coverage, and currency of abstracts and indexes; the quality and cost of each source—all this is straightforward librarianship, although a really thorough job can demand much time and ingenuity. To cite an example, when there are so many fine bibliographies, would be invidious.

Choosing what sources to acquire is the librarian's art of book selection. He must match what is available (*C* in Figure 2) with what is needed (*B* in the same figure), having regard to all the constraints under which he is operating—his budget, storage space, the accessibility of other stores, the availability of equipment to use special forms of document (e.g. microform), and so on.

A knowledge of means (procedures, techniques and equipment) is a second necessary skill of the librarian, but the rapid development of technology in the information field makes it difficult for the professional worker to maintain a wide knowledge. Document copying, microforms, data processing, communications links—these are some of the burgeoning areas with more and more impact on libraries.

Here there is scope for research. Librarians need to know what modern equipment can do, how it may be applied to library and information processes, what is its capacity and reliability, what staff skills are needed to instal and operate it, what set-up effort is needed, its cost, and so on. All this requires that equipment and techniques be tried out in laboratory or pilot conditions, and their performance be carefully assessed. Many trials are carried out, but often without the necessary assessment. The methodology of evaluating techniques and equipment needs considerable development.

Even when an adequate knowledge of the various means available has been built up (*E* in Figure 2), we face the problem of matching this with *B* and *D* in the figure, in order to select the means most appropriate to provide the required services using the chosen information sources. Because to the many variables within *B*, *D* and *E*, this matching is not a straightforward choice. It is in fact the art of the systems designer that we are considering.

Every librarian or information officer who gets a new service going has, well or ill, designed a system. The more systematically he has set about it, the nearer has his work come to an investigation proper. If sophisticated technology is to be used, systematic investigation becomes essential. Systems design is a field of research that is perhaps more demanding than any other, for it may involve much preliminary analysis, using a number of methods to provide data, followed by an imaginative synthesis, to produce a workable, effective and efficient system.[5]

Effectiveness

A library, an information centre, or any other man-made system, is designed to serve a certain purpose. It is effective if its purpose is well served. It is efficient if the job is done with no unnecessary expenditure of effort. Since user needs, available sources and available means are continually changing, the effectiveness and efficiency of every service ought to be continually checked.

Most librarians do this in a rough and ready way. It can be systematized by building 'management controls' into the operating system. An elementary form of control, widely used, is some quantitative measure of input (items accessed) and output (loans or photocopies made). A rising output may be taken as an indication of increasing effectiveness; and a rising output/input ratio may suggest increasing efficiency. A record of failures as well as successes may give a better measure of effectiveness (e.g. the NLL per cent of requests satisfied), and the total cost per request handled may be a better measure of efficiency. Operating management controls is not in itself research, but devising simple but significant controls can require systematic investigation and pilot experiment.

Starting from this point, increasingly sophisticated measures of effectiveness can be conceived, requiring correspondingly extensive investigations to apply. Instead of measuring simply the quantity of use, we can explore the quality—how in detail is the service used? For example, Margaret Slater and Stella Keenan[6] asked a panel of users to mark up an issue of *Current Papers in Physics* in order to find out how they scanned it, what proportion of it was of interest to each user, how much material he found of interest, which sections of the publication attracted most attention, and how this was related to the subject field of the user.

To take a completely different approach, what loan policy should a library adopt to give maximum satisfaction to its users? Buckland and Hindle[7] used as one measure of satisfaction 'the probability that a request for the loan of a given book will be satisfied immediately because it is on the open shelf'. The probability will depend upon the frequency and pattern of requests for a book, the number of copies held, the number of reservations allowed (removing the book from the open shelf), the frequency of reference use in the library, the permitted loan period, and the actual deviation from that period (overdues). At the University of Lancaster Library, estimates were made of the various factors involved, and a computer simulation was set up. Calculations were made as to how the satisfaction measure would vary as the loan period was altered. As a result, Lancaster decided that for the 10 per cent most popular books the loan period would be one week, and for the rest, till the end of term.

The development of measures of effectiveness appropriate to different situations is one of the most difficult tasks of research.[8] When we can define a specific and clear-cut function, a measure that is itself clear-cut and usable can be devised—the NLL's per cent requests satisfied is of this kind. But in more complex situations we find that (a) a library or information centre performs several functions, (b) we may be able to measure the effectiveness of each, but a joint measure of effectiveness is hard to devise, particularly since (c) high effectiveness in one function may be achievable only at the expense of effectiveness in another—for example, speed of service may conflict with accuracy.

Efficiency, cost-effectiveness, value

Testing the efficiency of a system is a matter of assessing the effort involved in operating it, and comparing this with other means of operation. This is the area of method study and systems analysis. A whole battery of techniques for the detailed analysis of operations has been developed for industrial management, and the problem for the library and information field is to master and make use of these techniques.[9] Careful examination, description and charting of a process can often lead to greater efficiency, by eliminating redundant operations, altering their sequence, rearranging the layout, and so on. Particularly in libraries, elimination or simplification of records can lead to economies.

Process analysis sometimes brings to attention the under-utilization of equipment, and suggests a reorganization of work to reduce this. Equally, it may reveal a far from optimum use of labour. Well-qualified staff may be spending too much time on clerical tasks. Clerks may be stuck too long at the same boring jobs. As procedures change—and particularly as new technology comes in—investigation is necessary into what staff skills, and what patterns of skills, are required.

To compare the efficiency of two alternative means of providing a service, we have to go beyond analytical description and get into work measurement and costing. Once again, the techniques are available, waiting to be used. But there is a research job here. Much work in individual investigations could be avoided if we had a better picture of the standard times and costs to carry out many library and information tasks. The big problem is to identify the level of task that can validly be taken as standard over a wide range of services.[10]

Simple comparison of the efficiency of two procedures is rarely possible if equipment is involved, because the two outputs are not strictly comparable. We can provide a photocopy on Xerox or on microfilm, but irrespective of relative cost the two products differ as to ease of use and other qualities. We can produce catalogue cards by ordinary typewriter or by tape typewriter, but the latter provides an extra product, the tape, which may be put to other uses. Rather than just comparing costs, we need to look at cost in relation to effectiveness. In such cases, effectiveness is not easily measured. With microfilm, for example, we have to deal with the quality we call 'acceptability'. With data-processing equipment such as the tape typewriter—or still worse, the computer—we are concerned with 'flexibility'.

The same is true as we move beyond specific procedures and begin to think of the effectiveness of a whole centre. We must then have recourse to subjective ratings of its 'value'. In the last analysis, all evaluation is subjective. A service to provide outdated editions of textbooks could invariably satisfy requests, and operate at minimum cost, but if no one wants old textbooks the value of the service is zero. So as well as asking 'is a function effectively performed?', we must ask 'is the function valued?'.

It can be argued that the best test of the value of a service is how much users are willing to pay for it. Commercial information services cannot evade this test. But many libraries and information centres do not operate in a market situation, since they serve a parent organization that subsidizes the whole operation. Evaluation must then be a matter of getting subjective ratings, from users and funders, of the centre as a whole and of its individual services. Relatively little of this kind of assessment has been carried out, and it is fraught with difficulties. One is that the assessment must be informed—the rating must be based on a real knowledge of what the service offers. A second is that the assessments must be weighted—the research director's view is worth more than the laboratory assistant's, but how much more?

The allocation of resources

The core of the library or information centre management problem can perhaps be summed up as: 'Here is my budget—how can I make best use of it?' In fact, how can we allocate resources effectively and efficiently? what is the optimum mix of services? Let me end this review of research methods by describing a sophisticated modelling approach to this problem, developed for university libraries at the University of Durham.[11]

The ideal of the systems designer is the bespoke tailor: each need of the user should be accurately measured, so that a perfectly fitting service can be designed. In practice, user needs are conflicting and hard to measure, so we may have to be content with a 'ready-made', adjusted here and there in the light of experience. The Durham team argued that in fact experience is a good substitute for experiment, and that by continuous interaction with users an alert library administration does provide a more or less optimum mix of services. Can the librarian be helped to quantify his judgements, and be provided with a tool to help him predict the effect of proposed changes?

A library carries out a number of activities. In the university library context, the Durham team considered the following to be relevant: acquiring and processing new stock, obtaining inter-library loans, providing for stock to be used on the premises, lending stock, providing photocopies, providing a place to work, and giving advice to users. How does the library rate these various activities? The team maintained that in practice, whatever subjective views may be held, the rating of an activity can be deduced from the resources devoted to it.

If the librarian knew the unit cost of each service, the volume of demand for it, and the price users would on average be willing to pay for it, he could allocate resources so as to maximize calculated revenue in relation to costs. The Durham team assumed that libraries intuitively do this. The problem is to make explicit the price ratings used. The inverse linear programming model developed at Durham does this. Into the model are fed (a) the total resources—in terms of labour time, money, seats and shelf space—available during the coming period of, say, a year; (b) the unit cost of each activity in these terms, and (c) the present volume of each activity—items acquired per year, loans per year, etc. By computer manipulation it was deduced that, in Durham Arts/Social Science Library in 1968, the situation was as follows: Adding one item to stock appeared to be rated as equal in user benefit to:

—providing 4.5 inter-library loans
—catering for 1270 user-hours of reading on premises
—providing 90 items on long loan
—or 203 items on short loan
—using 3.4 hours of senior librarians' time on advisory work
—or 9 hours of junior librarians' time on it.

With these ratings, the model can then be manipulated in the opposite direction, with some possible change in a resource, a unit cost or the volume of some activity, to determine the best way of allocating resources in the changed circumstances. Again, the librarian can subjectively decide that a rating should be altered—for example, that a short loan is just as beneficial to a user as a long loan—and determine a new optimum allocation. Constraints can be built in—for example, that the volume of acquisition must not fall below the present level.

The model assumes that the librarian by experience evaluates the benefit of each service, and in due course allocates his resources accordingly. What the model provides is a tool for quickly calculating the best way to change the allocation in the light of changed circumstances. The model is not concerned with the efficiency of each activity, though it can take account of a change in efficiency (i.e. in unit costs). Nor is it concerned with the effectiveness of each activity, except in so far as rated benefit may be related to effectiveness. That the model should be limited in its scope is to be expected; scientific methods are specific, each designed to do a particular job. What is important is that the scope and limitations of each method be clearly understood.

Conclusion

In this bird's-eye view of some of the main problems facing the practising librarian and information officer, I have tried to indicate the kinds of investigation to which they give rise, the variety of methods used and some of the difficulties encountered. I have mentioned user survey techniques, user needs analysis, bibliographic survey, equipment evaluation, systems design, management controls, measures of effectiveness, method study, costing, job analysis, value rating, the modelling of resource allocation. As I said at the beginning, there is no one method. Library and information service is a varied art that makes use of many technologies. It has to be studied from many points of view.

Some methods of investigation, traditional in librarianship, are well developed. Others are well tried in other fields, but relatively new in ours. In some, other disciplines are perhaps just as much novices as we are. The main problem that our research methodology faces is precisely this variety. Only slowly is a tradition of research and investigation being developed in the library and information field. The labyrinth that we must explore is complex, and we have much to learn.[12] We must be very open-minded about methods: quite unexpected approaches may succeed.

What should be evident from this variety is that the most necessary ingredient in research is not a manual of tested methods, important though these are, but imagination. To see the problems, to see how to tackle them, to see what the results mean, to see how they can be applied—this is the vision needed if research is to be an effective and efficient aid to practice.

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DISCUSSION

MR B. STERN (Wellcome Foundation) said that there was no reason why in an industrial organization the customer should not be charged for services received. At the Wellcome Foundation they were developing methods by which costs were charged back to requestors. A pilot-scale study had already proved successful for one type of service over a wide geographical area and further studies of other services and charges in different environments were to be carried out.

MR W. B. WOODWARD (Durham University) said that if investigations were to examine library practice and to attempt to place values on activities and decisions, then it was important that this work should be done on a realistic time scale. For example, while the PEBUL team was investigating Durham University Library, the cost of providing interlibrary loans was changed twice, by making a retention copy available and by running a minibus service to the NLL.

ANALYSIS AND ORGANIZATION OF KNOWLEDGE FOR RETRIEVAL

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Paper presented at the 44th Aslib Annual Conference, University of Aberdeen, 20th–23rd September 1970

IN A UNIVERSITY, the mode of research is usually what is called 'pure' or 'basic' research; since I am keeping in mind primarily the applications of information science, I will prefer the word 'basic', although there is not so much difference. In such research, and really in any good research, one should not be collecting data haphazardly. One must isolate and define a problem and, as far as possible, control other conditions so that interfering factors are eliminated. Preferably one will narrow down the problem to manageable proportions. It is then essential to approach the problem with some sort of hypothesis or theory of the situation, and to concentrate on obtaining evidence for or against that hypothesis. The important task is to devise just that crucial experiment which will give the answer as efficiently as possible. If the answer disproves the hypothesis, one has at least further evidence upon which to construct a different hypothesis; if it confirms the hypothesis, one is ready for a further step forward, and so on. Research is easier in a fully controlled and reproducible situation; in a biological or human situation one must often have recourse to statistical methods, but this does not alter the general methodology. On the whole, I find a clear methodology lacking in much that is being done in the field of information science today.

For the purposes of basic research, the processes of information storage and retrieval can be considered under three main heads, each with its own special problems. Firstly, there is the problem of representing knowledge accurately and reproducibly, whether it is in the input to a system, or the question put to the system. We can perhaps make a useful distinction here by defining knowledge as something in the mind, which a writer or questioner is trying to express, and by defining information as some form of transmitted knowledge, whether it be in speech or writing. The primary medium of such transmission is almost always some form of language, and we can include mathematics and drawings under this head; the accuracy of such media varies greatly. It must be realized that even when so-called 'free text' is used, the language involved may not represent knowledge with accuracy, so that a user may not express his question correctly. It is also possible that the information given by a writer, and even his original knowledge, may be inaccurate or ambiguous. The problems to be examined are those of the nature of knowledge, which is in the field of psychology, and of the peculiarities of language, which may be in the field of linguistics, but can also better be considered as problems of semantics.

The second area for study is that of the organization of the recorded form of the information. The problems here are simpler, and may concern only coding or various transcription procedures, whether human or mechanized processes; in each there is a certain probability of error; the elimination of such error is usually a matter of adequate control or checking procedures. There is, however, a more subtle underlying set of problems concerning the accuracy of the code or other recorded form of the information, in the semantic sense of accuracy. In a system—and by system I mean the whole set of rules and procedures by which any type of information storage and retrieval is to be carried out—the recording may distort the information in a variety of ways, and these problems have received far too little attention. For instance, the simple Boolean connectors often used to interrelate concepts, although they undoubtedly represent one possible type of linkage in the mind, are certainly only one specialized kind of mental operation, and may provide distortion if used alone. It is the likeness of Boolean connectors to the logic of electronic circuits that makes them deceptively attractive.

The third head of study is that of interpreting and satisfying the user's requirements. Here we have again the problems of the representation of knowledge in a statement of information (this time in the form of a question), but complicated by the fact that a question usually expresses uncertainty in the mind of the questioner, so that he may not be able to define the question with sufficient accuracy; and, more importantly, that the requirement does not remain constant, but will be liable to change with time and with any change in the user's range of knowledge, so that his judgement of relevance may alter, often without his realizing it, whenever he acquires additional information, for example in the first paper or other piece of information submitted to him.

There is of course a further important practical consideration, which some people regard as paramount, and that is the question of costs. For various reasons I regard this as a separate problem, in particular because it depends upon the value set on efficiency; people may well be prepared to pay more for a better result; or, in some cases, the costs depend upon the speed of obtaining the results when the needs are urgent. It also relates, perhaps, to the relative availability of manpower and machines; for example, it has become apparent that accurate machine translation, even if realizable, will be far more costly than are human translators. In practical applications, costs must always be borne in mind. In the theoretical or basic study of information handling, however, cost is an irrelevancy compared to the achievement of understanding and control which come with the attainment of scientific knowledge. In any case, with such knowledge, it will always be possible to modify methods to come within a required level of costs, although it may mean consciously accepting a lower standard of performance.

The fact is, however, that almost no systematic research to discover the basic laws relating to information and its organization has been carried out. As a result, there has been no proven and accepted method of information retrieval. The methods applied have been largely based on mere assumptions, such as that the most frequent words in a text, used out of context (except for other individual words selected), will accurately or adequately represent the subject matter; or that linguistic analysis is equivalent to semantic analysis, although the deficiencies of language can easily be demonstrated. When these methods have been found to be inadequate, they have been patched up by further haphazard devices, such as links or roles; or by generic posting, although the higher terms used are usually only a selection of several possibilities, and, furthermore, the generic relation is only one of several equally important relations between terms, such as the part–whole relation, or, for example, the more complex one of a micro-organism to the disease it engenders. Incidentally, these last criticisms will also apply to the standard library classifications when used as aids to information retrieval.

These considerations illustrate the weakness of the present position. Despite the many suggestions made, the variety of systems developed, and even some work dignified by the name of research, has there emerged any understanding of basic facts on which one can rely and build? Has there been any coherent, substantiated theory, such as is the basis of any other branch of science? The urgency of the information problem—sometimes more fancied than real—has encouraged specialists from many other fields to try their hands in producing quick solutions, usually by the very dangerous procedure of foisting the principles valid in one field (their own) on to the problems of information handling, without evidence that such alien principles apply. Hierarchic classifications, such as UDC, suffer from the erroneous philosophic assumption that all knowledge already exists and has only to be subdivided sufficiently for all details to be accommodated, although the method of subdivision has almost never been studied, and the growth of knowledge upsets the system; some more recent classifications contain other philosophic assumptions, such as the validity of the categories in the Colon classifications, or the application of general systems theory to the structure of knowledge. The very varied characteristics of different languages, and the limitations of their capacities to convey information, illustrate the pitfalls in relying upon the printed word; in communication we show our awareness of this by adding synonyms, emphasis, intonation, gestures and repetition in varied forms in order to clarify meaning. The use of weighting methods in co-ordinate indexing systems is also a reflection of this. The false drops and other forms of noise that we find in the output from retrieval systems result partly from lack of word control, but probably more from the lack of semantic control, which is essentially the control of relations between concepts; as mentioned before, Boolean logic is a very inadequate representation of the variety of relations employed by the human mind, and can be shown to be in some respects false. Consider the qualifier 'not'; the perception of a negative situation is in reality a complex mental operation, and is an inference from a lack of positive observations; there is however no such thing as a 'not-thing'—the expression 'not', as inferred semantically, applies to the verb in a statement: a thing 'is not'. The use of the 'not' qualifier thus introduces a subtle form of error. The apparent simplicity of copying the logic of computers, which is Boolean, provides a straight-jacket which cramps the expression of meaning. Even the use of a digital computer *may be* a limitation, because human thinking is not digital, but rather more analogue in character; the mind handles continuous variables in the sense of varying degrees and modes of association of concepts. The computer *can* be constrained to perform almost any matching or sorting operation we require; but information must not be stultified to fit the simple logic of the computer.

If we now turn to examine more closely the different methods of information retrieval in current use, the problems requiring investigation may become more apparent. Many people have upheld the ideal of carrying out both storage and retrieval entirely by machine, which means depending entirely on the reliability of an original author's text and of a questioner's text in imparting information in a manner which can be analysed by a machine. Apart from the need for very versatile reading machines, which are not yet available, this ideal has never been achieved in full. There must always be some provision for human intervention, even if only to deal with unforeseen words. Human intervention may usefully be applied at an earlier stage. In UKCIS, for example, the tests have shown better results with humanly controlled text than with uncontrolled text; results with the very controlled text of CBAC or POST have been better than with *Chemical Titles*. The 'free text' seems to be what is obtained 'free', that is in ready prepared form on tape, and the more pre-organized the better. The same applies to the question or profile put to the system; the less the work done on the input text, the more the question has to be manipulated by allowing for synonyms and other variations. Thus, as Miss Townley pointed out in a paper to the 1970 conference of the Institute of Information Scientists, the differences between such methods relate to the differences in the extent of auto-indexing; but the control of the input question is usually demanded from the questioner in establishing his profile. The results have as yet rarely been more than about 50 to 60 per cent efficient, which means that both recall and precision are of about that order. In some systems this has led to further recourse to the user in the form of feedback; the user is then faced with a problem for which he is rarely adequately prepared, the problem of deciding what changes must be made in his question in order to obtain a better result, although he is unlikely to have any appreciation of the logical problems involved. If the user is at an on-line terminal, he must also be familiar with answering back to a machine. There is evidence from Dr Altmann's work that the user tends to tire of the game before he reaches a good result; iterative search on a computer also becomes very expensive. One may also bear in mind the value of the user's time in eliminating unwanted material as well as in co-operating in feedback. All such approaches largely disregard the problems of the nature of knowledge or the possibilities of improvement based on such studies.

Methods based on word frequency are placing almost greater reliance on uncontrolled text, although this may be partly modified by the control provided by reference to a thesaurus or other form of dictionary file, such as a stem index. Since it is most unlikely that authors will write in any standard form, improvements can be achieved only by rather arbitrary decisions such as weighting, estimates of 'nearness' by clustering techniques, and so on. Again, the results have been disappointing. With syntactical analysis, it seems inevitable that results will vary with the language; for example, in Gardin's 'Syntol' system, the semantic interpretation of a subject seems to be too much dependent upon the syntactical characteristics of the French language; results from an English standpoint might be different.

With co-ordinate indexing, whether post-co-ordinate or pre-co-ordinate, human judgements are deliberately applied. Indexing terms are assigned by human selection from a thesaurus or a classification; the need for classification has been increasingly acknowledged in the construction of thesauri, and we thus do enter the field of semantic control, but insufficiently. Most thesauri seem very arbitrary in word selection, and the extent of classification (broader terms, narrower terms, related terms) is equally arbitrary. The English Electric 'thesaurofacet' is an improvement in this respect. Indexing with only a thesaurus tends however to lead to a choice of the terms that happen to occur in the text, or their approved synonyms, so that consideration of possibly more important implications of the subject matter may be overlooked. The further addition of links or roles remains very arbitrary; different lists of roles vary widely, and no attempt has been made to discover how any fundamental and universally applicable list can be devised; it would require an intensive semantic research. What is lacking in post-co-ordinate systems is an adequate control of the relations between concepts, so that the meaning intended between any two terms shall remain unique. The methods adopted to improve efficiency have thus been arbitrary; tests on links and roles have given conflicting results; the use of a large number of indexing terms results in no retrieval if too many are demanded in putting questions, or in a great deal of 'noise' owing to the greater possibility of chance combinations. In such systems the aims do not appear to have been clearly thought out, and indeed the history of post-co-ordinate indexing is one of trial and error in the face of poor results. There are rarely any rules by which the actual selection of terms is controlled in regard to accurate representation of the subject matter. This raises a difficult problem inherent in human indexing, that of decision as to the subject of a given text; the more the decision is made by a choice of *class* terms, the greater the range of possibilities, since most concepts can be considered from a variety of class standpoints. The problem is thus equally present in methods of pre-co-ordination, or classification, of the hierarchic type; synthetic methods of classification can obviate much of the difficulty. Pre-co-ordinate indexing gives better results because it receives more intellectual effort.

From this rapid and obviously incomplete survey the conclusion I would draw is that the problems which I initially stated have been given very little, if any, consideration. These problems I would like again to emphasize: the nature of knowledge, the nature and influence of coding and other organizational devices, and the characteristics of the user. These problems must be approached with appropriate scientific methodology, step by step, if a sound working basis of established fact and theory is to be achieved, and it is only on such a basis that progress will be made. Hit or miss trial of this or that device will succeed only by chance, and such chances will be small. Such trials, even though extensive, will not give an orderly and progressive development of our knowledge. There is also a danger of drawing inaccurate conclusions when the effects of this or that single procedure are being examined; the retrieval situation is subject to a large number of variables, as in any human situation, and when only one variable is being controlled it is highly likely that any effects will be swamped by the predominating influence of all the other uncontrolled variables.

For a scientific approach, it is essential first to control as many variables as possible in order that the effects of varying or relaxing *one* control can be studied. It seems to me that many results of tests, and in particular the apparent trading relation between recall and precision, may be showing only the predominant influence of uncontrolled variables.

The method of amassing a large number of observations about a situation, as in much operational research, in the hope of finding some guiding principle, is equally likely to be disappointing. Such researches present a picture of what exists; because they are not carried out with the objective, at least, of testing some hypothesis, they do not yield principles for improvement. The greater value of such researches are the indications of faults and failures, and such researches may therefore be necessary to a limited extent in the first place.

Scientific methodology demands a more exact, regulated approach to problems. When some facts of a situation are known, a tentative hypothesis of its underlying factors and their effects can be made, and researches should then be carried out to test that hypothesis; whether it is proved right or wrong, an advance in knowledge will have been achieved, and the way will be clear for further tests. I would repeat here the warning against the facile imposition of theoretical principles from different disciplines; for example, it seems to me improbable that theories applicable to electronic communication will be valid for human communication of knowledge, since the human brain is in many respects very different from, say, a computer; the computer must essentially conduct searches serially, whereas the human brain appears to be capable of multiple simultaneous searches and associations within its memory. One must of course avoid the fallacy that mechanization, by itself, will solve any problems; the computer is an idiot-machine, and the results depend entirely upon our input and instructions to the machine.

In my own researches I have endeavoured to follow such principles of scientific method. All the evidence seems to support the value of applying controls, though there are arguments as to which controls are useful and I do not find evidence to date satisfactory in respect of such choice. The methodology of examining highly controlled situations will give better results. In regard to the problems concerning human knowledge, I have tried to develop principles, for test, based upon existing psychological evidence of the mechanism of human thinking; from this I have derived a table of categories of relations between concepts, and, in the research carried out by Miss Hills and Dr Datta, a new framework for concept control by a system of synthetic general classification has been developed, also on the basis of psychological evidence. It has not been possible to do anything much with respect to coding and manipulative procedures, but the psychological basis also yields some possible principles for test. As regards the user, the aim has been to find methods of following the user's vagaries, such as by browsing techniques which will simulate the user's range of uncertainty. A research on what I call 'condensations', the user's habits of stating questions in a shortened form in which detailed terms have been omitted, has shown that the empirically hypothesized mechanisms of such condensations are substantiated in controlled tests; a start has also been made on the reverse process, to discover where and how a user would expand his initial request with insertion of further details, details which were really in his mind all the time. I have hopes that in a future research it may be possible to investigate how different statements are ***combined***, so that one may be able to retrieve two or more documents which ***between them*** will answer a question.

The researches have become progressively more detailed; initial attempts were made with an average of about four terms for indexing a document, and the representation was in linear form, with the terms linked by relational symbols. With controlled permutation, this method was also applied to making the subject index for an abstracts journal, since it almost automatically yields all desirable cross-reference entries in a fully consistent form. In the research already referred to, two-dimensional representation was used, and more detailed subject analysis was attempted. This research was carried out on an indexed collection of over a thousand documents prepared for retrospective search, in the field of sugar technology. In research now being undertaken by Miss Yates-Mercer at the City University, we are creating an SDI situation together with still more detailed indexing, and the examination of various browsing techniques derived from the psychological evidence of user peculiarities.

Owing to pressure of work, the results of the first research are still awaiting full publication, but it may be of interest to show a few examples of the actual indexing. An early example of the linear representation is:

Sugar Cane/: Sugar, Raw/; Filterability/– Measuring/; Filter

This represents a paper on a filter for measuring the filterability of raw cane sugar. Controlled permutations of this, for subject index entries, are, for example:

Sugar, Raw [:/ Sugar Cane] /; Filterability/– Measuring/; Filter·
Filterability [;/ Sugar, Raw :/ Sugar Cane] /– Measuring /; Filter·
Filter ;/[Sugar Cane/: Sugar, Raw/; Filterability/–] Measuring

A more complex example from the first research at the University is:

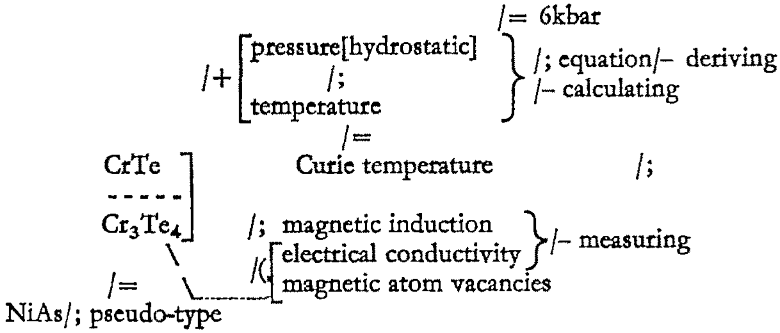
```
        ⎧ Sucrose     ⎫
Rat /*  ⎨             ⎬ /– Feeding
        ⎩ Coconut oil ⎭
  /(
Liver  /(  Glycogen
```

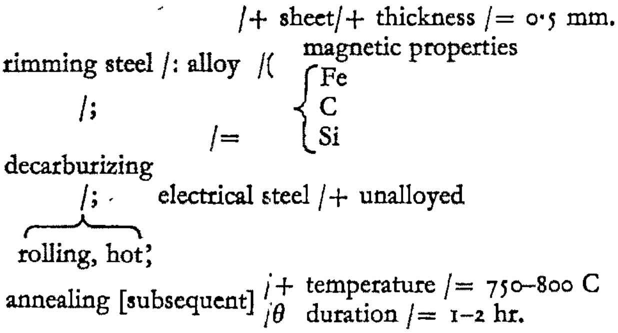
This represents a paper on the glycogen content of the liver of rats fed on sucrose with coconut oil.

A much more complex example from this research, showing a ring of interrelated terms, which cannot be represented linearly, is:

```
Sugar, Raw/: Melt Liquor/: Melt Liquor, Phosphatated,
    /–           /–                      /–
  Refining                             Filtering /+ Refinery /+ Texas  .
 Decolorizing /;Phosphatating           /;               / =
                                     Kieselguhr       Imperial Sugar Co.
                                        /=
                                     Filter-Aid
```

The present research is being carried out with metallurgical literature, and two examples are:




/+ sheet/+ thickness /= 0·5 mm.
rimming steel /: alloy /(
magnetic properties
Fe
C
Si
/;
/=
decarburizing
/;
electrical steel /+ unalloyed
rolling, hot;
annealing [subsequent]
/+ temperature /= 750–800 C
/θ duration /= 1–2 hr.

Terms such as deriving, measuring, etc. are introduced to show the main objectives of the papers. The method is very self-regulatory in the sense of forcing correct semantic interpretation of the subject of a document, and even of forcing the use of some intermediary terms. Such indexing no doubt appears very complicated, but is in fact quite logical, and I would note that Mr Digger, working with Mr Keen on comparative testing of indexing methods, at Aberystwyth, achieved rapid mastery of the method.

The results of the first research show, in the best set of figures obtained from several variations of procedure, an average recall ratio of about 60 per cent, an average precision of about 93 per cent (for 50 per cent of the questions the precision was 100 per cent), and fall-out ratios below 0.01 (again, 50 per cent had zero values). The loss of recall was to a considerable extent traceable to human error or user vagaries, and was hence not system error (except in so far as the system may induce human error). Since the original questions were taken and used *unaltered* except for synonym control, recourse was had to the users at a later stage to reconsider their judgements (made from the total literature) in the light of their more obvious vagaries, and also omissions due to their haste in making the surveys of the whole literature (*after* their questions had been processed). In some cases, there was no retrieval and users found no relevant papers, so that this is a *good* result, which cannot however be assessed in averaging.

Graphs (or scatter diagrams), in which are plotted the ratios for each individual question, show, on a recall:precision diagram, that almost all the results come in the top right-hand quarter of the diagram; on a recall:fall-out diagram, the results are almost all very close to the left-hand edge, and appear to fall on a Q curve of 0.995; a very few results look as though they might conform to a lower Q curve, but the reason for this has not been traced. With some of the questions further documents can be recalled by the browsing techniques tested. It is clear that relational indexing can give very good results.

In the present, second research the more detail indexing will enable browsing techniques, such as condensations and 'conceptual equivalents' to be investigated more fully; the SDI situation means that user judgements can be requested in small doses (one month's issue of abstracts), and profiles are being continuously adjusted, if necessary. We are also hoping to investigate new test criteria, as we have many reasons for doubting the adequacy of recall:precision diagrams when used alone. We are therefore looking for other, and possibly quite different, measures of efficiency. Such new measures will also be examined in another research being carried out to test an operating SDI system. The question of valid test measures is in itself another field of research, but it is hoped that the figures obtained will at least indicate the possibilities of new ideas; re-examination of the whole theoretical picture of the test situation is perhaps necessary; the present frequently-used basis of the 2 × 2 table, derived from its use in very different research situations, may well be inadequate or misleading, but it will not be easy to find a more reliable basis.

The information problem has been recognized as urgent. In two investigations the waste of money involved in research which, for lack of information about published work, was perhaps unnecessary or would have been done differently, has been estimated at six million, or possibly twelve million pounds annually in this country alone. OSTI's total budget for research in this field is about half a million pounds, and much of this is being devoted to the development of operating systems which have not been shown to be very efficient. There is clearly a need to return to basic research; the empiricism of the last twenty years is no substitute. Accurate mathematical and statistical procedures will be necessary in research; and semantic theory must be made more exact. Above all, we must make the information problem an area of scientific study.

DISCUSSION

MR R. A. FAIRTHORNE (Independent) said that the reference to some basic distinction between analogue and digital computers seemed rather confused. The actual difference was not just one of engineering; the internal representation of qualities by non-discrete or discrete physical phenomena. 'Non-discrete' was by no means the same as 'continuous'. Continuous variables were concepts. They could not be represented physically. He thought that the speaker may have been distinguishing between devices with explicit programs and those with implicit or heuristic programs, i.e. adaptive or so-called 'learning' devices. We knew little about the latter, but evidence suggested strongly that the future would reveal not their possibilities, but their very severe limitations. MR FARRADANE replied that if one was going to use a machine for information retrieval, it would be better to use a machine that was capable, as far as possible, of representing human knowledge. In this sense an analogue computer had more potential than a digital computer.

MR M. HAINES (Gas Council) asked the speaker what form the user profiles took in the SDI service that was associated with the speaker's research into relational indexing He asked whether the user had to frame his question within the confines of a format which permitted direct matching to the indexing of the data bank being used. MR FARRADANE replied that profiles were transcribed into the indexing language with a controlled terminology and were continuously adjusted. The user's comments were used not only to adjust his profile but also to provide experimental data. In this way analysis in the 'laboratory' was possible without having to ask the user to inspect the complete collection.

MR R. C. WRIGHT (Royal Aircraft Establishment, Farnborough) said that Mr Farradane had mentioned something to the effect that the user was unlikely to have much appreciation of the logical problems involved when he changed his question. It seemed to Mr Wright, however, that users of IR systems might reasonably be expected to have this appreciation. MR FARRADANE replied that the user was rarely capable of understanding the system's logic and so could not predict the effect that changing a search term would have on the system performance.

MR L. CORBETT (AWRE Aldermaston) asked Mr Farradane whether, in his SDI experiment using *Metals Abstracts,* he had considered the parallel use of machine matching based on the titles of the papers, to see how effective, comparatively with his relational indexing, were methods based solely on the authors' words. MR FARRADANE replied that he had not conducted any comparative tests of this type because he was only concerned at present with the mechanics of the indexing process. He also pointed out that there was considerable variation between the words used in titles and the words used in the abstracts of corresponding articles.

MR K. JONES stated that he supported Mr Farradane's quest for perfection since costs varied from day to day and what may even seem to be too expensive today may be acceptable tomorrow. MR FARRADANE replied that he was not looking for operational perfection but for what was important in the mechanics of indexing. One looked for natural laws so that one could understand and be capable of manipulating them.

MR N. K. LEIGH (ICI Mond) asked Mr Farradane whether relational indexing was an appropriate technique for collections of information (say 50,000 items at an acquisition rate of 2,000 items per year) in specialized research and development subject-areas where fine-scale searches and cross-fertilization of ideas were positive requirements: conventionally, such collections would use alphabetically-arranged, multiple-entry indexes using controlled descriptors and detailed indicative abstracts. MR FARRADANE replied that he had used relational indexing for just such a collection with apparent success.

MR A. E. CAWKELL (ISI) said that it seemed extraordinary that computer mystique still had such a hold and that computers were regarded as possessing a personality—usually malevolent. It would have been far better if some term such as 'data processor' or 'symbol sorter and printer' were used. This was descriptive of all the types of machine applications that had been discussed. He pointed out that when the magnitude of boring, repetitive, and increasingly expensive human clerical tasks reached a certain level, the time came to consider mechanization. No mysterious benefits or disasters would occur. As had always been the case, if garbage is fed in, garbage will come out, however sorted, ordered and presented.

CURRENT RESEARCH IN MECHANIZATION

HARRY EAST

Aslib Research Department

Paper presented at the 44th Aslib Annual Conference, University of Aberdeen, 20th–23rd September 1970

I HAVE APPLIED a fairly liberal interpretation to the title given to me by the Conference Committee. Much of what I am going to say comes under the heading 'recent developments', for much of the valuable empirical work that has been done recently would hardly qualify in intellectual integrity for the title 'research'. One of the themes I wish to explore is the extent to which advances in mechanization are predicating a move towards rationalization and standardization in many areas of library and information work, and conversely how trends in these directions require us to examine problems whose existence has largely been unrecognized or ignored.

Since this paper is concerned with achievement and aspiration, it would be as well to sound one warning note, using the words of one of the distinguished speakers at this conference. In a recent review, Fairthorne[1] has said: 'Huge sums are expended in the belief, not that the problem of indexing (content analysis) is solved, but that it does not exist. The symbol is believed to be the sense, so that all you need for information retrieval is to play unprincipled word games on a computer. This belief is widespread in management circles because they have been told by their computer experts that it is true. Though the latter may believe that the principles of computer science are the principles of library science, it is distressing and potentially disastrous, that others should be infected by them. It should be clear to management that the principles of computer science are not the principles of managerial science any more than they are of medical science, or indeed of anything but computer science. However, it is obviously not clear and clarity will come only through expensive failure, as has happened before.'

Having introduced the topic of expense, I should go on to say that whatever improvements in service that we look to mechanization to provide, and however persuasive we are in relating increased costs to increased benefits, we must continue to look to mechanization as a means of increasing productivity in libraries. Ralph Schoffner[2] has pointed out that approximately 0.1 per cent of the US Gross National Product is expended on libraries in which personnel costs account for about two-thirds of the total expenditures. In present conditions the increase in cost of library operations must be more rapid than the increase in cost of living, because there has been no improvement in productivity per man hour to offset the cost increases. Thus there is a higher rate of inflation in libraries than in the economy as a whole, a situation exacerbated by the increasing demands made on library services. It is likely that the situation in Britain is comparable, though perhaps not yet so advanced, and that we must continue to regard mechanization as a potentially important economic factor in our operations.

Unfortunately, a significant lesson that has been learnt during the past few years is that improvements, say, to library housekeeping operations by the introduction of computers into the system are slow to develop. Often it is found that, although the service was working well enough before mechanization, its operations had not been examined analytically and its complexities not well enough understood to provide an adequate machine specification. Thus the library of the University of Bochum[3] planned total automation in five years; the present plans, which are less ambitious, extend the development over ten years. Even more serious was the attempt at Florida Atlantic University at total automation which to quote Cox[4] 'illustrates all the worst features of activity in this area—ambitious statements of intent, lively reporting of activity, but without distinguishing whether these reports were intentions or realizations, followed by a long period of silence, punctuated by ugly rumours. In fact it turned out that the whole project had been abandoned, by direct order of the Council of the University, but the reasons for failure are still obscure, which is a pity because at least some of that information might have justified some of the several million dollars wasted.'

Nevertheless, there have been a number of significant projects in computerized housekeeping operations, as a brief review of the British scene alone will show. Most of these projects have been concerned, naturally enough, with mechanizing existing procedures, and to a large extent they have attempted to simulate classical library techniques.

Two important developments, one originating in the UK, the other in the United States, and both now of international significance, are the Standard Book Numbering scheme and the MARC format.

The Standard Book Numbering scheme[5] was formulated in 1967 by a committee of the British Publishers Association, with Professor Gordon Foster as consultant, and with the advice of the BNB. The scheme is now administered by an agency which is a co-operation between J. Whitaker and Sons, the BNB, and the Publishers Association. It was started in Britain primarily because of the increasing use of computers in the book trade. The number consists of three parts: a publisher code, a serial number and the check digit. Publishers responsible for over 80 per cent of the books published in Britain allocate their own SBNs to their titles, the remainder are allotted by the agency. Thus we now have an operational scheme where the majority of books published have a unique identifying number printed in the book; the numbers also appear in the publisher's literature, in the BNB and in other bibliographic books.

It is easy to underrate the significance of this development as just another number which perhaps ought to be included in the library catalogue, but carrying little information except a cryptic code indicating the publisher. However, its compactness, uniqueness and universality make it an ideal and economic vehicle in book ordering, and many related activities (e.g. invoicing, royalty computation). Recent, and as yet unpublished, work of the Aslib Research Department and the SE Regional Library System has indicated that the SBN be used economically and effectively in producing by computer compact finding lists for storing locations of books in regional interlending systems. Trials with these lists have shown that identification by SBN can be more efficient than, and as equally effective as, the use of more conventional union catalogues in this context. Moreover copies of such lists are easy and relatively cheap to produce and update, so that they may be made available to a large number of libraries rather than a single file reposing in one central unit.

In October 1969, the Standard Book Numbering system was adopted in a modified form as an international standard. The modification consisted of adding an additional digit to indicate a national or geographic group, but has no significant effect on existing British SBN and which are now prefixed, or are assumed to have been prefixed, with a group identifier 'o'. This rather simple device, now that it has received fairly wide international acceptance, should greatly simplify book ordering and already several publishers prefer to receive orders in the form of simple lists of numbers, and are prepared to offer financial incentives to large customers who use this technique.

The various MARC projects[6] and the evolution of a standard MARC record for international exchange is clearly a major development. What is perhaps not clear is just how, and how quickly, libraries are going to take advantage of the service. This development started as an experiment by the library of Congress as a new way of distributing catalogue data in machine readable form. The end product of the MARC I project was essentially a catalogue record on magnetic tape, and the later version—MARC II—still retains a preoccupation with the visual organization of a catalogue entry. The development from the first to the second phase included recognition of the fact that it is virtually impossible and probably undesirable to plan a record format in terms of direct compatibility between two or more systems. Local requirements, either from tradition or intrinsic need, are often different, as are the available computers and the software needed to drive them. The MARC II project, run concurrently by, and involving a great deal of consultation and co-operation between, the Library of Congress and the British National Bibliography, essentially aims at providing a communications system, so that libraries wishing to exchange bibliographic information may readily do so.

In such an arrangement, the visual layout and typographical distinctions, which are a matter of local library decisions, do not restrict the interchange of information in machine readable form. The structure or format of the computer record, however, is very important, since unless it is organized by precise and predetermined rules, the machine is not able to recognize the various data elements (author, title, publisher, etc.), and hence unable to manipulate them in the required manner. (In fact, algorithms can be written which identify elements by syntactic analysis. This technique, however, requires complex programming and tends to use expensive computer time rather excessively.) The technique adopted in the MARC system is to give each bibliographic element a tag which the computer can recognize. The record structure is a great deal more complicated than a string of tagged elements, but it is beyond the scope of this paper to go into greater detail. Suffice it to say that the MARC record structure has been carefully designed to hold any type of bibliographic record. Librarians may not wish to hold all the information included in a MARC record (which is comprehensive and large) and they may wish also to add local information. The computer available locally may impose limitations. But the availability of a generalized communication format does make it possible for general file-handling programs to be written to convert records to local formats, which would obviate the need for large numbers of conversion programs if such a standard did not exist.

Thus, there exists an internationally recognized standard for exchanging bibliographic records on magnetic tape and the bulk of new British and American publications are now being processed in the respective national bibliographic centres to produce records adhering to this standard. The library community faces the problem of making optimum use of these tapes. It would be naïve to assume that these problems will be rapidly solved. In principle it can fairly easily be shown that a majority of library housekeeping procedures consist of mainly, but not entirely, basic clerical activities on a relatively small number of bibliographic elements. In practice these procedures turn out to be far more complex. The stage is set for a period of experimentation and evaluation. It is all too easy to list the short-comings of a centralized tape service, and there is no shortage of armchair critics ready to do this: the tapes do not contain all the records needed, they do not appear quickly enough, the cataloguing style is different from the local one, and so on. In the discussion at a conference on libraries and automation over seven years ago F. B. Rogers attacked this type of criticism: 'It seems to me that that type of question gets nowhere. The trouble with librarians is that they say all we want is everything. You will never get anything at all this way. What the librarian must do is decide what his purposes are and he cannot state these purposes in large general terms such as: "What I want to do is make my operation more efficient." He cannot state these in very specific terms: "What I want to do is get a set of cards for one half-cent a card." This absolutely will not do and will get you nowhere. You must decide what your major purposes are, stated in some terminology that people can understand. You must not only state those purposes, but you must rank those purposes in some order; you cannot act as if everything you do has equal value on this scale.'

One almost inevitable trend that is already becoming evident is that the cost in terms of time, manpower and machine time of exploiting the MARC service (or indeed any tape-based information service) makes co-operative development essential. Most libraries simply do not have the resources to develop and maintain their own computer-based systems. Co-operation in regional schemes—as with the South Western Universities or the Birmingham groups—is clearly one pattern for the future. Regional co-operation offers the possibility of units large enough to make maximum effective use of mechanization while providing enough flexibility in the system to satisfy the peculiarities of local requirements.

In the area of scientific information services, some patterns are emerging. In the main, scientific societies are acting as a focus for development of discipline-oriented information systems. Almost every large-scale abstracting and indexing service in the West has developed, or is in the course of implementing, computer-assisted operations. In the majority of situations where an organization collects, assesses, abstracts and indexes information and disseminates the results of these activities on a large scale, there exists a *prima facie* case for mechanization. This is because the activities can be shown to consist of a complex of intellectual, quasi-intellectual and purely clerical operations. The clerical operations to be found in abundance are those of transcription and arrangement. Often it is considered desirable to delegate as many as possible of the clerical operations to machinery. Various decision criteria are used—cost, speed, accuracy, and availability of staff being the most common. Thus it may be possible for the producers of an abstracts journal to justify the use of computers purely on the grounds of production efficiency. (Such an event is unlikely, but conceivable.)

On the other hand, it is now widely recognized that the availability of information in machine readable form has much wider potentialities than merely as a medium for journal and index production. The history of *Chemical Titles* exemplifies this. The publication was computer produced from the outset because, presumably, there were one or more production criteria which indicated this approach. However, since all the information included in this publication is available in machine readable form, its use in a number of well publicized selective current awareness services has possibly been of greater benefit than through its availability in conventional hard copy. It is tempting to make sage predictions here concerning the future of the printed word versus computer dissemination, but advisable to refrain from doing so, since the publication in this case was hardly an outstanding example of typographic art and the assessment of the contribution selective dissemination services is by no means straightforward. In any case, the either/or approach to computer services versus conventional publication is, in my opinion, somewhat unrealistic: in many cases the question is one of complementation rather than competition.

It is now widely recognized that the abstracting and indexing services have an increasingly important part to play in the information world—first, by fulfilling their conventional role and, second, by providing the information that they collect in a form that can be used by them, or others, to provide computer based services. It is in this context that the term 'data base' has arisen, and taken on an almost mystical quality. Like a navel, everyone concerned with information work has one of these, though in the past we may have been too shy to talk about it. We have used euphemisms like file and index. A machine readable data base is a structured file of data having some common characteristic stored in a machine readable medium. Its structure is largely determined by its purpose.

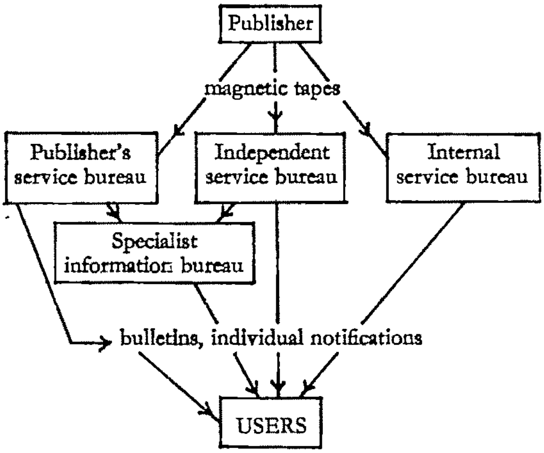
The MEDLARS system was originally based on tapes created to print *Index Medicus*. Inasmuch as the system has revealed shortcomings in computer subject search, this can partially be ascribed to the fact that the subject index files were primarily designed with a conventional printed index in mind.

In contrast to this, the Euratom system was designed with machine search as a primary objective. A thesaurus was constructed with the clear intention of using it to provide descriptions for complex co-ordination in a machine. These design criteria have had a marked and beneficial effect on the performance of the system in terms of pertinence, recall and efficient computer use.

A number of services provide tapes which permit search for words in titles. Often the service itself publishes a computer produced index from these tapes

(ISI's Permuterm is an example). A growing number of selective dissemination services are being fed with this material, and in turn distribute current awareness notifications to individuals and groups. There are a number of channels to the user (Fig. 1):

FIGURE 1: *Current awareness services from a common machine-readable 'data base'*


Publisher
magnetic tapes
Publisher's service bureau
Independent service bureau
Internal service bureau
Specialist information bureau
bulletins, individual notifications
USERS

1. The publisher offers an SDI service (e.g. ISI's ASCA—based on the source tapes of the Science Citation Index).
2. A private organization obtains tapes and provides notifications for users within the organization (e.g. Shell uses ACS tapes, Unilever uses ISI's source tapes).
3. A service bureau obtains tapes and processes them for subscribers (e.g. UKCIS uses ACS tapes).
4. A specialized information centre uses publishers or service bureau systems to obtain references which it 'repackages' and distributes to special groups (e.g. the gastro-intestinal absorption SIC[7] uses the ASCA and UKCIS service to obtain items for its bulletin).

The user may be an individual or a member of a group with common interests. He may be supplied with individual notifications or with a bulletin, containing titles only, or titles plus abstracts, with or without a document back-up service, providing hard copy or microfilm.

This clearly is a complex situation and if data bases are to be effectively used, they have to be a little more than by-products of an abstracts journal publication system.

In the Research Department of Aslib we have been faced with some of these design considerations in our recent work for the Commonwealth Agricultural Bureaux. This organization publishes abstracts and indexes on agricultural research topics in eighteen basic 'packages', coming from fourteen geographically separate units. We were asked to explore the extent to which the activities of the bureaux could be fruitfully aided by mechanization. Fairly obviously, by analogy with existing mechanized services, introduction of computers into the production of the abstracts journals and indexes would improve printing schedules, make the sorting and cumulation of author and subject indexes a less painful activity, and provide magnetic tapes for subject search. The record structure on the tapes should be as close as possible to a viable international standard (e.g. the MARC format) to enable the tapes to be used with software developed with other systems.

Less obvious is what provision to make in advance for manipulation of the machine readable record by subject. It is matter of policy, and justifiably so, that the integrity of the existing broad subject division of the abstract journals—animal breeding, animal health, horticulture, soil science, etc.—be preserved. It was also clear to us that there are broad topics of importance—for example, crops, climate, chemicals of agricultural importance—that cut across this classification.

The 'natural language' approach to this problem is to ignore it at input, so that each search of the file becomes an *ad hoc* examination of titles and subject index phrases for relevant words which may be present in the record. There is considerable evidence to show that this works tolerably well for weekly or fortnightly current awareness searches. When it comes to retrospective search on large files, the results are perhaps less satisfactory and there is a tendency for *ad hoc* thesauri to be developed as search aids in the hope of increasing the precision of retrieved references.

On the other hand, using controlled vocabularies at the input stage requires a deal of intellectual effort in creating, maintaining and using thesauri and in some cases does not necessarily produce better results in search than the natural language approach.

Again, this is not a simple either/or situation, and to regard it as a subject for debate, as does apparently the Institute for Information Scientists Meetings Committee in its programme for next year, trivializes the problem. In some fields the terminology is more stable than others, as are the patterns of user interest. The half-life of information also varies with the subject matter, and this affects the size of the files to be searched. Certain classifications, if not eternal, are of very long standing, and in agriculture for example the very useful division of 'temperate' and 'tropical' is only likely to be affected by the imminence of the next ice age. While both systematic and vernacular names occur for a particular biological species, the problem of synonym control is not so great as with the trade names of agricultural chemicals.

We came to the conclusion in our study that control of vocabulary and the building in of relationships were both possible and desirable down to a certain level. Beyond that level, post co-ordination of 'natural language' terms would be increasingly more effective. Where this level lies is a nice point—somewhere below the line where it is no longer possible to identify a packageable concept for a known user group.

To summarize, there are a number of questions concerning machine readable data bases that remain unsolved. These include:

1. their optimum structure and content;

2. their potential user groups and *their* needs;
3. the networks by which they are to be exploited;
4. their inter-availability (since the interests of users often extend over their boundaries);
5. their cost to obtain and exploit;
6. the hardware and software requirements.

Hardware and software lead to the last topic. The majority of computer operated retrieval systems work in the batch mode, which has a number of basic weaknesses. Borko[8] has listed the following:

1. the need for intermediaries which tend to distort or misinterpret the user's intention;
2. the rigidity of the system in that it is difficult to modify queries;
3. the unacceptably long interval between the time the request is entered and the response is received;
4. a lack of user confidence, since the result received may not contain certain relevant material the requester believes to be available.

While it is true that all these problems occur with batch systems, it remains to be seen to what extent on-line interrogation eliminates them. Again, let me climb on the fence and say from it that this is not necessarily an either/or choice. In some cases a user simply may not want to bother with using a console because he is too busy, or too stupid or too important, just as he may not want to bother to use a card catalogue. The intermediary, however, might find on-line access preferable. In some cases, the nature of the enquiry will require a high recall, and the large number of references retrieved will be more conveniently printed out on paper, which is portable, than displayed on the tube of a console, which is not.

Conceptually, an interactive system has many attractive features. First as an aid to indexers, as a scratch pad to record and store indexing decisions, to permit display of indexing vocabulary and thesaural relationships, and to examine how previous documents have been indexed.[9] As an aid to the searcher, it can display vocabulary, relationships and frequency counts, and can instruct him in framing questions. It can supply him with sample references to help him to decide whether to broaden or narrow the search. In the more sophisticated systems, it can accept relevance judgements and automatically adjust the search strategy, this being a distinct advantage over most batch systems where interaction would increase the delays.

Assuming that on-line interactive systems are an attractivepr oposition, let us examine some of the factors which are likely to determine the rate at which they might be adopted into real, as opposed to experimental, systems. Reintjes[10] has indicated that the following factors are significant:

1. The quantity of information that is stored in the computer. This factor is, in turn, related to the size of the operational library involved.
2. The size of the on-line user community.
3. The manner in which the data base is formatted and the character of retrieval programs that are provided for accessing the data base.

4. The hardware and software organization of the on-line time-sharing system itself.

Real time applications require random access storage. To store the catalogue of a library holding 100,000 volumes is certainly technically feasible. To include in this file separate entries for journal articles would probably be taxing current storage technology up to its limit. However, the limitations here are more concerned with the very high costs in doing this. Cheap mass storage may not be far away, but it has not arrived yet. Thus, it is argued by Salton[11] and others, the expense of random access storage is not justified in most practical situations where, in fact, the activity of the file is low.

The number of people using the system simultaneously is an important factor. Systems exist where forty simultaneous users can be accommodated and newer systems will accommodate more. But increasing the number of users also tends to make the response time more sluggish and in an evaluation study of the NASA RECON system[12] it was observed that, while off-line users were usually willing to wait more than twenty-four hours for a response, console users become impatient after the passing of a minute.

The rudimentary nature of the input/output console has given rise to an amount of fair criticism. Typewriter consoles are noisy, and those not used to keyboards find them slow to use. However, they do produce portable hard copy at the point of search. Cathode ray tube displays present the information more quickly, although technical problems like flicker and lack of character definition can make them tiring to use.

In a number of on-line systems it has been found that some people simply do not like using the consoles. Apparently, top management in parts of IBM[13] has not responded too favourably. At Armonk an information control room 'has been equipped with a combination of computer terminals and conventional filing systems'. Specialist information officers are used as an interface between top management and the machine. Similarly at the Nuclear Safety Information Centre (NSIC)[14] it has been observed that 'less frequent use of existing consoles is principally due to the fact that the working scientist/engineer soon realizes that the most effective and efficient retrieval can be done by those who are thoroughly familiar with the way in which the information was input'. So much for getting rid of the intermediaries! In this case the procedure developed was as follows: (a) the request is phoned to NSIC; (b) the query is formulated by NSIC specialists and entered through a console; (c) the output is printed on the information specialist's and the user's console.

Where the user rejects personal manipulation of the console, the reasons for doing so are not always clear and controlled experimentation over the next few years may shed light on this problem. Two fairly obvious factors are:

1. Inability to co-ordinate the hands and eyes to make effective use of the keyboard. Better design could help here as will the passage of time. Many of the aspects of recent technology which I find difficulty in adapting to are accepted unquestioningly by my children as part of the rich pattern of modern life.
2. The system is not easy for the uninitiated to use. In the NSIC system for example, the search statement required appears to be in the form of

numerically coded keywords, separated by logical operators, together with assigned weights. In such circumstances, I for one am not surprised that scientists and engineers hand their search problems over to intermediaries.

It seems to me that while the availability of terminals might bring about some shifts in user behaviour the general wide pattern of behaviour will still remain. There is no 'typical' user. Present experience shows that with our conventional tools, some users are highly motivated to do their own searching, some will willingly delegate to an intermediary, while others will avoid the problem as long as possible. Improvements in the design of motor cars may have resulted in some corresponding improvement in the standard of driving, but I doubt that the effect has been particularly marked. Of course, we may be dealing with the kind of technological innovation which brings about sweeping changes. Fairthorne has given us examples of this in his paper.[15] It may be that our descendants will view with incredulity our lack of appreciation of how the availability of computer terminals in every home and public building was bound to increase the birthrate and lower the price of gin.

Unfortunately most of us have to work with past experience and limited imagination. In my view certain design criteria seem more promising than others. First we are fairly safe in assuming that the computer console is going to become a fairly common device for feeding in and extracting information from large files. For certain types of activity it may be the preferred device for communication, just as the telephone has superseded the letter. In general, the simpler a device is to use, the more wide its acceptance.

Better design of consoles is important, but more important is the ability of the user to approach the system using natural language, or, at worst, a meta-language which is very close to natural language. I am not saying that the system will necessarily operate with natural language, but that at the man-machine interface this is highly desirable, if not mandatory. Nor am I suggesting that the user should be inflicted with systems which require him to enter search statements like COW OR COWS OR CATTLE OR KINE. Only highly motivated users in pilot experiments are likely to respond to these demands. In fact, I am not sure that a user seeking information on a PURPLE COW is going to be too happy about being prompted as to whether he is also interested in COWS, CATTLE or KINE of the same hue: feedback could be as much of an irritation as a help in some cases.

Now if my assumptions are reasonable, the software requirements are formidable. Much of the work done on Salton's SMART system, although this has been developed in the context of batch processing, is relevant. It remains to be seen how practicable this is within the short term.

It has to be remembered that no user really wants a reference retrieval system. What he usually requires is a small number of documents having a high probability of containing useful material. A fast reference retrieval system is only useful as an adjunct to a fast document delivery service. Inasmuch as consoles bring library catalogues and indexes closer to the user, he is likely to demand easier availability of documents. I do not intend to discuss full text storage here, but would refer those interested to the excellent article by Reintjes referred to above[11] which deals with this and other matters.

In conclusion, a great deal of the work with computers in our field has demonstrated what perhaps was already known. That machines can help in simple straightforward activities is fairly obvious. But the problems of organizing and exploiting information are complex and not fully understood. Developing technology gives us the opportunity of re-assessing these problems from a new angle, and this is valuable, but only rarely can it offer solutions. Like the character in the children's story we should distinguish between progress and change.

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DISCUSSION

DR B. G. DUTTON (ICI Mond Division) agreed that data bases intended for mechanized systems should be more than by-products of abstracting services. He said that the *Chemical Abstracts* system, although one of the largest data bases, used a form of presentation which was a jumble of informative and indicative abstracts, and had remained essentially unchanged since 1907.

MR P. R. LEWIS (City University) questioned the implied criticism that libraries take refuge in perfectionism rather than formulate their objectives and priorities in the face of centralized bibliographic systems. His work on BNB systems indicated clearly that the criticisms most frequently made of such systems were the productions of such a formulation, and that systems such as MARC had been designed with regard less to the objectives and priorities of users than to the technical requirements of producing the system.

MR JULIAN BLACKWELL (Blackwell's) said that following the ISBN developments, the ISSN (International Standard Serial Number) was being investigated by a BSI Committee. The ISSN was likely to be an eight digit number, incorporating a modulus II check digit; it would identify the journal title, and provision was being made for a prefix and suffix identifying volume and part. Whitaker's and the BNB were also going to provide in 1971 a machine readable 'availability file' which would contain ISBN, author, title, publisher and price. The file would contain some 250,000 items and would be updated weekly. A feasibility study was in progress to study the possibility of having this file on the Book Centre's computer so that it might be interrogated by visual display units anywhere in the UK. This system could be used as an interface between the bookseller's and publisher's computers, and was likely to have applications for libraries. Discussions were in progress between the Book Trade and the National Libraries ADP study team.

MR L. CORBETT (AWRE, Aldermaston) drew attention to the ISSN and the CODEN systems. Those involved in their development should be aware of the desirability of standardization, if tapes from various sources were to be merged, to be exploited in the types of current awareness services that Mr East had discussed.

MR A. SANDISON (NRLSI) said that for libraries the problem with standard book numbers was that they were not unique. The same text, in different bindings, or from different publishers, received different numbers. The numbers would be more valuable if all the variants of one text had a number which was identical except for one identifiable part of the code.

MR A. G. MACKENZIE (University of Lancaster) agreed that while the use of ISBN for library housekeeping purposes was an attractive idea, a major difficulty was that pre-1969 British and foreign books need to have a compatible number which would still be unique. He wondered if there were programs, or if programs could be devised, to generate such numbers?

MR M. B. LINE (Bath University) reported that in the National Libraries ADP Study, the problem of applying unique book numbers retrospectively, as part of the large question of converting the British Museum Catalogue into machine readable form, was being studied. He suspected that it was difficult to derive unique codes of a reasonable length from the catalogue records, and that arbitrary numbers may have to be applied.

Letters to the Editor

MANAGEMENT INFORMATION SERVICES

Dear Sir,

I would like to take issue with one aspect of John Blagden's otherwise excellent summary on management information services in *Aslib Proc.*, 1970, **22**, 492–6. I fully agree with him regarding the limited usefulness of *Management Abstracts*. This cannot be considered more than a current awareness medium for the busy executive. The lack of indexes and the small number of abstracts (about 50 in two months) disqualify this publication from the reference shelf of management libraries.

I feel that John Blagden is less than fair to *ANBAR Abstracts* in pairing it with *Management Abstracts* as a retrospective searching tool. The latter cannot be used as such while the former is the only British abstract journal in the field of management. The 200-odd abstracts published monthly covering about 200 titles are not only adequately indexed but the indexes are frequently cumulated. By the nature of the subject the abstracts must be selective. I have carried out many retrospective searches over the last few years and found *ANBAR* a reliable tool. This does not mean that we cannot think of ways of improving the service, such as the provision of a separate firms index of papers dealing with management problems and case histories in specific companies.

Yours faithfully,

T. LANDAU

Information Officer

Metra Consulting Group Limited,
23, Lower Belgrave Street,
London SW1.
6th November 1970

Dear Sir,

I should be grateful if you would allow me to clarify a reference to the ANBAR Documentation Service made by John Blagden in his useful survey of management documentation services, published in the October issue.

On page 493, Mr Blagden states that *Management Abstracts* and *ANBAR Management Services Abstracts* should not be used as retrospective searching tools in the way that one would use *Chemical Abstracts* to obtain a comprehensive set of references on a particular subject because both are highly selective. He continues: 'This is not, however, a serious disadvantage, as the whole emphasis on management documentation is on relevance and not recall.'

Rather than 'not a serious disadvantage', I would suggest that ANBAR's selectivity is a positive advantage since the selection is done by subject specialists who are instructed to ignore articles not clearing an—admittedly subjective—quality hurdle. It is misleading to mention the selectivity of BIM's *Management Abstracts* and ANBAR in the same paragraph. Each quarterly issue of the BIM service contains something like 50 abstracts, compared with more than 200 in each monthly issue of ANBAR, and the BIM's selection policy has never been quite clear.

Mr Blagden fails to mention the quarterly *ANBAR Management Services Index*, which cumulates throughout the year and makes retrospective searching very easy, or *ANBAR Management Services Bibliography*, which is particularly useful because of its references to published reviews.

I think Mr Blagden would probably agree with most of what I have written, and that his description was a simplification because of the technological bias of his audience. This probably also accounts for the rather odd comparison of the two management abstracting services with *Chemical Abstracts*, which of course *aims* at comprehensiveness (and, incidentally, costs a somewhat different subscription!).

If any librarian/information officer would like full information about ANBAR, which has recently expanded its coverage quite significantly following an agreement with the Institute of Chartered Accountants in England and Wales, I should be happy to supply it.

Yours faithfully,
K. G. B. BAKEWELL

ANBAR Publications Limited,
P.O. Box 23,
Wembley HA9 8DJ.
7th November 1970

John Blagden replies:

I certainly would not basically disagree with the comments made by either Ken Bakewell or Tom Landau. In defence, I did state that neither *Management Abstracts* not *ANBAR Abstracts* should be used if a *comprehensive* set of references on the topic is required.

This point is reinforced by the fact that there are in existence well over 500 management journals according to the latest BIM list, whilst ANBAR covers about half of that number. However, comprehensiveness in practice is very rarely required in the management situation (as I stated in my article), and undoubtedly ANBAR, with its superior coverage, is more likely to provide the more meaningful list.

One factual error in Tom Landau's letter, the BIM does produce an index and this is available free of charge from the publications department. To date, however, these have not been cumulated.

CURRENT AWARENESS LIST

Recent additions to the Aslib library catalogue are broken down into twelve broad groups, whose coverage is indicated below. These groups are not mutually exclusive but it is hoped that users will find them helpful in scanning for new items of interest.

Note: These categories have been revised since the December 1969 list.

User Studies
Analyses of information-seeking, literature-use and library-use patterns; user training.

Communication and Knowledge
Flow and organization of knowledge, including national policies; information theory

Information Processing Systems
Dissemination, processing, storage and retrieval techniques and systems; data centres; management information systems.

Language and Indexing
Linguistics, semantics, nomenclature, terminology; subject headings, thesauri and their construction; indexing; abstracting; translating.

Classification and Cataloguing
Documentary and non-documentary coding; cataloguing; filing.

Mechanization
Automation in libraries, broadly, including 'housekeeping' procedures; machines applicable in libraries; computer technology.

Subject Organization
Special libraries and specialized documentation centres; sources of information including reference books and bibliographies; reference and inquiry work.

Reprography
Materials, methods and systems; facsimile transmission; telex.

Printing and Publishing
Writing and editorial work; printing and publishing; periodical references and citation patterns; bookselling; copyright; legal aspects of computerized information.

Administration and Management
Special library and information service policy, buildings, furniture and staff; stock including special materials; lending and journal circulation.

Library Systems
National libraries; general libraries and documentation centres; university and college libraries; inter-library co-operation.

Professional Activity
Library science, information science, documentation; professional associations, education, literature, organizations and research; biographies; directories.

JANET WALKLEY
Librarian

CURRENT AWARENESS LIST

*Items are available in the Aslib library and may be borrowed unless marked * to indicate reference copies.*

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BUILDING AND CIVIL ENGINEERING TRANSLATIONS from Russian and German into English. G. L. Cairns, MA, 92 Southwood Lane, London N6. Tel. 01-340 8990.

TECHNICAL SWEDISH, DANISH, NORWEGIAN translated by J. T. Craddock, B COM, FIL, Ekard, Ray Park Avenue, Maidenhead, Berks. Maidenhead 24931.

RUSSIAN/ENGLISH TRANSLATIONS. Chemistry, electronics, mechanical engineering. Twenty years' experience Government Department. A. de Merindol, 19 Ingelow House, Kensington, W8. 01-937 6788.

JAPANESE/ENGLISH, RUSSIAN/ENGLISH translations. Chemistry, medicine, biology, zoology. D. A. Fraser, BA, MIL, 22 Gresley Road, London N19 3JZ. Tel: 01-272 5664.

WILFRED E. GOODAY, ARSM, DIC, C.ENG, MIMM, FIL. Member of Translators' Guild, Romanian and French. 161 Rivermead Court, London SW6. RENown 1912.

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TECHNICAL AND COMMERCIAL translations from English into Russian. Mrs O. Linsley, 31 Parke Road, Barnes, London SW13. Tel. 01-748 8822.

TECHNICAL TRANSLATIONS from Japanese into English. R. A. Scutt, BA, 48 Somerset Avenue, West Wimbledon, London SW20. Tel. WIMbledon 1713 (01-946 1713).

TRANSLATIONS: TECHNICAL, SCIENTIFIC, all west-European languages. J. Smuts, B SC (ENGINEERING), FIL, 12 Thorndene Avenue, London N11. Tel. 01-360 7723.

TECHNICAL OR COMMERCIAL translations into/from English, German, Dutch and French. A. M. H. Speller, FIL, NGV, 6 Lakeside, West Ealing, London W13. Tel. 01-998 1045.

TECHNICAL TRANSLATIONS in all west European languages. Electronics and other special fields. Camera copy, printing. Peter Suchodolski, FIL (ENG), 70 Greenfield Gardens, London NW2. Tel. 01-458 2239.

AUTHORITATIVE TECHNICAL TRANSLATIONS. Spanish, French, Italian, German, Portuguese, camera copy or printed. E. W. Sykes, FIL, 39 West Close, Wembley, Middlesex, HA9 9PJ. Tel. 01-904 4273.

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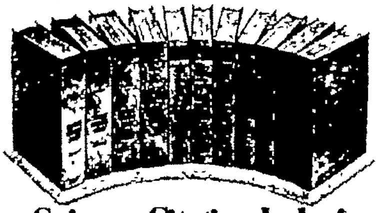

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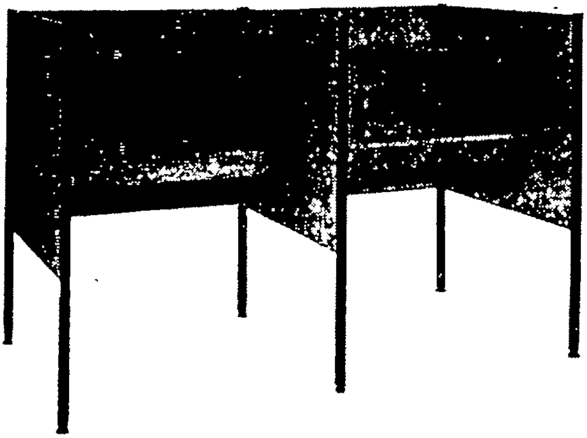

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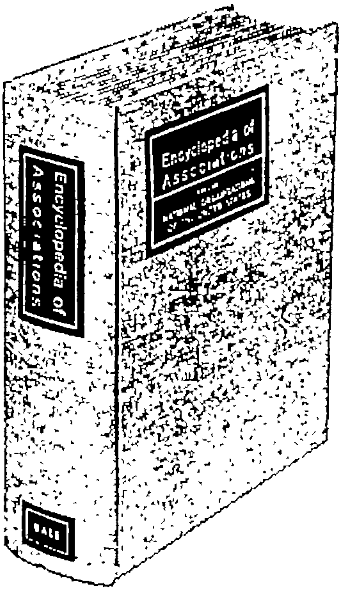

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